Other quality meat traits, as juiciness, flavor, thawing and cooking losses did not differ among the three groups. Carcass yield was also similar for the groups. Immunocastration was effective in producing carcass traits similar to that of surgical castration. Therefore, this vaccine appears to have practical utility in the management and castration of grazing bulls in Brazil.

Key Words: LHRH immunization, Carcass, Bulls

Ruminant Nutrition: Nutritional management & transition

412 Nutritional management of the dairy cow: Minimizing disorders to optimize production and maximize profitability. T. R. Overton* and M. R. Waldron, *Cornell University, Ithaca NY.*

Successful lactation depends on sound nutrition and management programs that are interdependent. Attention to detail in these areas, especially during the periparturient period, is a major determinant of farm profitability. Sound reproductive and nutritional management during the breeding period and gestation are required to achieve optimal body condition (BCS) at parturition. Typical recommendations for BCS at parturition are 3.5 to 3.75; however, recent data indicate that cows of BCS ∼3.0 may have improved health and early lactation performance. Management of periparturient BCS is critical to minimize the extent of negative energy balance and its associated mobilization of adipose that results in elevated plasma NEFA levels. Plasma NEFA can accumulate in the liver as triacylglycerol (TAG) and impair both metabolic and immune function. Superior nutrition and management can avert excessive TAG accumulation during the peripartum period. Dietary supplementation or oral administration of nutrients or compounds such as choline, niacin, calcium propionate, propylene glycol, glycerol, fat, and trace minerals are used as prophylactic measures when nutrition or management is suboptimal. Though commercial use of these supplements is common, recent data and review of the research literature indicates efficacy only under certain circumstances and when administered by specific methods. Recent data also have provided possible physiological links between the associations of primary infectious disease with the occurrence of secondary metabolic disorders, thereby emphasizing the importance of sound energy, protein, and macromineral nutrition for immunocompetence of the periparturient cow. Dietary vitamin and trace mineral supplementation above NRC requirements or from alternative sources have been emphasized to promote immune function. Although in vitro data sometimes are supportive of this practice, research into the requirements of these nutrients to optimize immune function in lactating dairy cows needs to be conducted.

Key Words: periparturient cow, metabolism, immune function

413 Feeding glycerol to transition dairy cows: Effects on dry matter intake, milk production, and blood metabolites. J. M. DeFrain*[1], A. R. Hippen[1], K. F. Kalscheur[1], and P. W. Jardon[2], [1]*South Dakota State University, Brookings,* [2]*West Central Soy, Ralston, IA.*

Twenty-one multiparous and nine primiparous Holstein cows blocked by parity and expected calving date were used in a randomized block design to evaluate the effects of feeding glycerol from 14 d prepartum until 21 DIM. Energy density and crude protein were 1.50 and 1.65 Mcal/kg and 16.5 and 18.6 % for pre- and postpartum diets, respectively. Treatments (kg/d) were: 1 of corn starch (CON), 0.5 corn starch + 0.5 glycerol (MIX), or 1 glycerol (GLY), topdressed, and hand-mixed into the upper 1/3 of the TMR. Prepartum DMI was greater for cows fed CON compared with MIX or GLY (13.0, 10.9, and 10.9 ± 0.36 kg/d, respectively). Postpartum DMI was not affected by treatments. Milk yields during the first 70 DIM were greater for multiparous cows fed CON or MIX than for GLY (44.7, 44.1, and 39.9 ± 1.48 kg/d, respectively) whereas milk yields of primiparous cows fed CON or GLY were greater than for MIX (29.2, 29.1, and 26.1 ± 2.32 kg/d). The MIX and GLY diets decreased MUN relative to CON (14.04, 12.52, and 12.59 ± 0.46 mg/dl, respectively). Prepartum plasma glucose, BHBA, and NEFA were not affected by treatments. At 7 and 14 DIM, plasma glucose was similar among treatments; however, plasma glucose in cows fed CON and MIX were greater than those fed GLY at 21 DIM (67.5, 64.9, and 50.2 ± 3.71 mg/dl, respectively). Feeding GLY decreased plasma NEFA at 7 DIM compared with CON and MIX (458, 855, 896 ± 118 μEq/L, respectively); however, NEFA were similar among treatments at 14 and 21 DIM. There was a tendency ($P = 0.07$) for animals fed GLY to have greater concentrations of plasma BHBA postpartum (7, 14, and 21 DIM) compared with CON, but BHBA levels in cows fed MIX were intermediate to those fed CON and GLY. These data indicate glycerol fed at 1 kg/d delayed the onset and degree of fat mobilization during the first 3 wks postpartum. The greatest potential for glycerol to prevent ketosis was observed during the first 7 DIM and the optimal inclusion rate is between 0.5 and 1 kg/d.

Key Words: Periparturient, Glycerol, Metabolites

414 Effects of prepartum diet and postpartum drenching on production performance and blood parameters of early lactation primiparous and multiparous Holstein cows. B. M. Visser*, J. G. Linn, S. M. Godden, and M. L. Raeth-Knight, *University of Minnesota, St. Paul, MN, USA.*

This study was a 2 x 3 factorial with 3 prepartum dietary treatments and a propylene glycol (PG) drench of 0 (-) or 300 (+) ml on day 1 and 2 postpartum. Prepartum diets were control (C), anionic supreme (A), and base supreme (B). Diet C was 75% forage and a 25% mixture of corn, soybean meal, minerals and vitamins. Supreme diets were 61% forages and a 39% mixture of corn, soybean meal, sugar, soluble fiber, yeast, enhanced minerals and vitamins with (A) and without (B) anionic salts. All cows received the same postpartum diet the first nine weeks of lactation. Seventy multiparous (M) cows were assigned to diets A, B and C and 32 primiparous (P) cows were assigned to diets B and C starting 21 days before parturition. Half of the M and P cows assigned to each dietary treatment received the PG drench. Diet A reduced DMI prepartum of M cows compared to cows fed diet B and C over the 21 days prepartum (12.1, 13.5 and 14.4 kg/d for diet A, B, and C), however, cows fed diet C had the largest decline in DMI week -1 prepartum (20%, 13%, and 12% for diet C, A, and B). There was no effect of diet, drench or diet by drench interaction within parity on milk yield or milk components the first nine weeks of lactation. Milk production for M cows was 49.1, 48.1, 49.3, 48.2, 46.9, and 46.7 kg/d for treatments A-, A+, B-, B+, C-, and C+ the first nine weeks of lactation. Milk production for P cows was 34.4, 32.6, 33.0, and 33.3 kg/d for treatments B-, B+, C-, and C+ for the first nine weeks of lactation. Milk fever incidences of M cows fed diets A, B, and C were 0%, 4.8%, and 22.7%. Ketosis incidences were 12% and 25% for P cows and 17% and 13% for M cows on drench (+) and (-), respectively. Blood calcium concentrations of M cows fed diet A were higher ($P<0.05$) at parturition (8.3 mg/dl) than for cows fed diets B and C (7.9 and 7.4 mg/dl). Blood glucose concentrations of P cows were higher ($P<0.05$) the first 7 days of lactation (87.4 vs 76.8 mg/dl) with drenching (+).

Key Words: Transition, Metabolic, Drench

415 Interrelationships of prepartum dry matter intake with postpartum intake and hepatic lipid accumulation. J. K. Drackley*, *University of Illinois, Urbana, IL.*

Grummer (JAS 73:2820) reported a correlation (r=0.54) between dry matter intake (DMI) 1 d prepartum and DMI 21 d postpartum. We reported previously, however, that cows fed restricted amounts of diet during the dry period had greater DMI postpartum and less lipid accumulation in liver (JDS 81[Suppl. 1]:295). The hypothesis tested here was that extent of prepartum DMI decrease is more important than actual prepartum DMI for postpartum DMI and hepatic lipid content. Multiparous Holstein cows (n=50) were fed 1 of 5 diets during the dry period; anionic salts were added during the last 14 d prepartum. Three diets were fed for ad libitum intake; two were fed to supply only 80% of calculated NE_L requirements. All cows received a lactation diet postpartum. Mean DMI for wk -3 and wk -1 were 12.0 kg/d (range 6.2 to 21.3 kg/d) and 9.2 kg/d (3.0 to 18.3 kg/d). Decreases in DMI at wk -1 from wk -3 and at d -1 from d -7 averaged -20.0% (-10.0 to -77.1%) and -23.3% (-31.5 to -93.0%), respectively. Contents (wet weight) of total lipid and triglyceride (TG) at d 1 postpartum averaged 7.0% (3.7 to 16.9%) and 4.6% (0.3 to 15.5%), respectively. DMI for wk 3 postpartum was not correlated with DMI prepartum. DMI for wk 1 postpartum was

correlated with DMI for wk -1 (r=0.44, P<0.01). In contrast, DMI for wk 3 postpartum was correlated (P<0.01) with percent changes in DMI during the last 3 wk (r=0.43) or last 2 wk (r=0.41) prepartum. DMI for wk 1 postpartum was correlated (P<0.01) with percent changes in DMI during the last 3 wk (r=0.34), last 2 wk (r= 0.49), or last week (r=0.39) prepartum. Contents of total lipid and TG in liver at d 1 postpartum were negatively related to decreases in DMI during the last 3 wk (r= -0.63 and -0.63), last 2 wk (r= -0.67 and -0.65), and last 1 wk (r= -0.42 and -0.38) prepartum. Liver total lipid and TG were positively correlated to actual DMI for wk -3 or -2, and were not correlated with DMI for wk -1. Early postpartum DMI and hepatic lipid content are more highly related to changes in DMI during the last 3 wk prepartum than to actual DMI prepartum.

Key Words: Dry matter intake, Dry period, Liver

416 Compariosn of three fresh cow feeding programs. W. F. Miller*, J. E. Shirley, E. C. Titgemeyer, A. F. Park, A. K. Hammond, M. V. Burgos, and M. V. Scheffel, *Kansas State University*.

Thirty-three multiparous and 27 primiparous Holstein cows were utilized in a randomized block design to evaluate the impact of long-stem alfalfa hay top dress to a total mixed ration (TMR) on lactation performance and plasma metabolites of early lactation dairy cows. Cows were blocked by parity and calving date with 11 replicates for multiparous cows (BW=722 ± 11.9 kg; BCS=2.73 ± 0.12) and nine replicates for primiparous cows (BW=609 ± 13.2 kg; BCS=3.30 ± 0.13). All cows were fed a total mixed ration (TMR) containing 22% chopped alfalfa hay, 27% ground corn, 10% corn silage, 20% wet corn gluten feed, 9% whole cottonseed, 7% soy bean expeller meal, 1.3% fish meal, 1% molasses, and 2.7% mineral-vitamin premix. Treatments were: 1) TMR (R), 2) TMR top dressed with 1.36 kg long-stem alfalfa hay at 0600 h (A), 3) TMR top dressed with 1.36 kg long-stem alfalfa hay at 0600 h and 1.36 kg dry rolled corn at 1200 h (AC). The TMR was offered for ad libitum intake at 0600, 1200, and 1600 h daily. For the initial 5 d of lactation body temperature, BW, BCS, rumen contractions, and milk ketones were recorded, and plasma was harvested from coxygeal blood. Milk yield was recorded for 30 d postpartum with samples (a.m. / p.m. composite) analyzed for fat, protein, lactose, and urea content weekly. Milk and milk components were similar among treatments. Plasma glucose and urea nitrogen was not affected by treatment but significantly affected by day (P < 0.05) and age (P < 0.05). Primiparous cows were lighter and had a higher BCS (P< 0.05) than multiparous cows. Average plasma NEFA concentration, as well as those on d 2 and 3 were lower (P < 0.05) for multiparous cows consuming diet R (693, 743, and 661 mmol/L, respectively) than for multiparous cows consuming diet A (928, 1099, and 1039 mmol/L, respectively). Rumen contractions were greater (P < 0.05) for multiparous cows than for primiparous cows. Top dresses of long-stem alfalfa hay or of long-stem alfalfa hay and ground corn was not beneficial for the TMR fed in this study.

Key Words: Alfalfa hay, Fresh cow, NEFA

417 Effects of prepartum dietary energy concentration and Ca-propionate on transition performance. A. E. Beem*[1], H. G. Bateman[1], C. C Williams[1], C. C. Stanley[1], D. T. Gantt[1], Y. H. Chung[1], and F. R. Valdez[2], [1]*LSU AgCenter, Baton Rouge, LA,* [2]*Kemmin Americas, Des Moines, IA*.

Forty-one Holstein cows (mean BWT 669 kg) were grouped by anticipated calving date and assigned to one of four treatments that were arranged as a 2x2 factorial of 105 or 145% (NRC, 2001) of prepartum dietary energy requirements with or without addition of 113.5 g Ca-Propionate/d (NutroCAL^{TM}, Kemin Americas, Des Moines, IA). All cows were fed the same basal diet postpartum. Ca-propionate supplementation continued postpartum. Cows were individually fed and DMI was measured daily. Milk production was measured and sampled at each milking. Blood samples were collected 3x/ wk and analyzed for β-hydroxybutyrate (BHBA). Urine was collected 3x/ wk and analyzed for pH, acetoacetate, and BHBA. Due to factors unrelated to treatment diets, there was a high incidence of health disorders such as retained fetal membranes, uterine infections, displaced abomasums, and laminitis observed during this trial that probably impacted any observed treatment responses. There were no statistical differences ($P > 0.05$) observed in these data.

	Normal (-) Ca-prop	Energy (+) Ca-prop	High (-) Ca-prop	Energy (+) Ca-prop	SEM
DMI, Prepartum	9.5	8.7	9.9	8.8	0.97
Postpartum	12.6	10.3	13.3	10.8	1.61
Milk, kg	26.2	20.8	25.3	23.1	2.80
Fat, %	4.1	4.3	4.3	4.2	0.28
kg	1.1	0.9	1.1	0.9	0.12
Protein, %	2.7	2.7	2.9	2.8	0.12
kg	0.7	0.6	0.8	0.6	0.09
SCCS	3.1	4.3	4.1	4.3	0.57
Urine pH	8.0	8.0	7.9	7.9	0.08
Urine acetoacetate	15.2	17.6	16.1	12.2	6.12
Urine BHBA	6.6	15.7	16.1	12.2	6.16
Plasma BHBA	7.9	8.3	9.6	7.2	2.07

Key Words: Calcium propionate, Transition cow, Ketone

418 Prepartum dry matter intake, serum nonesterified fatty acids, liver lipid and glycogen contents, body weight, and body condition score for cows fed different diets during the dry period. H. M. Dann*, N. B. Litherland, J. P. Underwood, M. Bionaz, and J. K. Drackley, *University of Illinois, Urbana*.

Multiparous Holstein cows (n=74) were fed different diets during the far-off (FO; dry-off to -25 d before expected parturition) and close-up (CU; -24 d to parturition) periods in a 3 (FO) x 2 (CU) factorial arrangement to determine the effects of prepartum nutrient intake on prepartum dry matter intake (DMI), concentration of nonesterified fatty acids (NEFA) in serum, liver lipid and glycogen contents, body weight (BW), and body condition score (BCS). During the FO period, cows were fed a control diet (FOC; 1.29 Mcal NE_L/kg, 12.7% CP) at ad libitum (A) intake or a diet with excess nutrients (FOE; 1.59 Mcal NE_L/kg, 15.1% CP) at either A or restricted (R; 80% of calculated NE_L requirement at dry-off) intake. During the CU period, cows were fed a diet (CU; 1.54 Mcal NE_L/kg, 14.5% CP) at either A or R (80% of calculated NE_L requirement at dry-off) intake. During the FO period, DMI was higher (P<0.05) and serum NEFA lower (P<0.05) for FOEA (2.0% BW; 123 μEq/L) than FOCA (1.5% BW; 174 μEq/L) or FOER (1.0% BW; 218 μEq/L). Body weight was lower (P<0.05) for FOER (679 kg) than FOEA (711 kg) or FOCA (701 kg). Body condition score was higher (P<0.05) for FOEA (3.16) than FOCA (3.04) or FOER (2.94). At -30 d before parturition liver total lipid and glycogen contents averaged 4.1 and 4.4%, respectively and did not differ (P>0.05) among treatments. During the CU period, cows fed CUA had higher (P<0.05) DMI (1.8 vs 1.0% BW), BW (727 vs 713 kg), and BCS (3.15 vs 2.99) than cows fed CUR. Cows fed CUA had lower (P<0.05) serum NEFA (204 vs 307 μEq/L) and liver total lipid content (-14 d; 4.2 vs 4.7%) than cows fed CUR. Liver glycogen content (-14 d; 3.4%) did not differ (P>0.05). The FO diets affected (P<0.05) serum NEFA, BW, and BCS during the CU period. Cows fed FOEA had higher serum NEFA, BW, and BCS than FOCA and FOER in the CU period. Prepartum changes in serum NEFA, BW, BCS, and liver lipid content were consistent with plane of nutrition.

Key Words: Transition cow, Nutrient intake, Liver

419 Prepartum nutrient intake alters metabolism by liver slices from peripartal dairy cows. N. B. Litherland*, H. M. Dann, A. S. Hansen, and J. K. Drackley, *University of Illinois, Urbana*.

Understanding impacts of plane of nutrition before parturition on hepatic partitioning of long chain fatty acids to CO_2, acid soluble products (ASP) and esterified products (EP) may provide a basis for improved health and productivity. Multiparous Holstein cows (n = 71) were fed different amounts of nutrients during the far-off (FO) and close-up (CU) dry periods in a 3 (FO diet)× 2 (CU diet) factorial arrangement. During the FO period (d -60 to -25) cows received a control diet fed ad libitum (FOCA) to meet NRC (2001) recommendations, a diet fed ad libitum to exceed NRC recommendations for NE_L by 20% (FOEA), or a diet fed at restricted intake to meet 80% of FO NE_L requirements

(FOER). During the CU period (d -24 until parturition), cows were fed a diet ad libitum (CUA) to meet NRC recommendations or in restricted (CUR) amounts to provide 80% of calculated NE_L requirements. All cows received a lactation diet postpartum. Liver slices from biopsies at d -30, -14, +1, +14, and +28 relative to parturition were utilized to determine in vitro conversion of [1-^{14}C] palmitate (PALM) to CO_2, ASP, and EP. Conversion of PALM to CO_2 decreased on d 1 for FOEA (FO × day, $P < .03$). As a percent of total PALM metabolism, conversion to CO_2 decreased at d 1 for all FO treatments; FOEA declined most (FO × day, $P = .07$). Conversion of PALM to ASP increased on d 1 for FOCA and FOER, with FOCA significantly higher than FOEA ($P < .03$). Esterification of PALM increased on d 1 for all treatments. As a percent of total PALM metabolism, EP formation tended to be greater on d 1 for the combination of FOEA plus CUA than for cows fed FOCA or FOER (FO × CU × day, $P = .06$). Total PALM metabolism increased on d 1; cows fed FOCA had greater rates than FOEA ($P = .05$). Excessive energy intake during FO and CU promotes decreased hepatic oxidation and increased esterification of PALM, consistent with triglyceride accumulation postpartum; CU diet had less effect than did FO diet. Supported by USDA-NRI no. 2001-35206-10946 and Illinois C-FAR.

Key Words: Liver, Dry period, Fatty acid metabolism

420 Prepartum nutrient intake has minimal effects on postpartum dry matter intake, serum nonesterified fatty acids, liver lipid and glycogen contents, and milk yield. H. M. Dann*, N. B. Litherland, J. P. Underwood, M. Bionaz, and J. K. Drackley, *University of Illinois, Urbana*.

Multiparous Holstein cows (n=74) were fed different diets during the far-off (FO; dry-off to -25 d before expected parturition) and close-up (CU; -24 d to parturition) periods in a 3 (FO) x 2 (CU) factorial arrangement to determine the effects of prepartum nutrient intake on postpartum dry matter intake (DMI), serum nonesterified fatty acids (NEFA), liver lipid and glycogen contents, body weight (BW), body condition score (BCS), and milk yield. During the FO period, cows were fed a control diet (FOC; 1.29 Mcal NE_L/kg, 12.7% CP) at ad libitum (A) intake or a diet with excess nutrients (FOE; 1.59 Mcal NE_L/kg, 15.1% CP) at either A or restricted (R; 80% of calculated NE_L requirement) intake. During the CU period, cows were fed a diet (CU; 1.54 Mcal NE_L/kg, 14.5% CP) at either A or R intake. Cows were fed a lactation diet (1.61 Mcal NE_L/kg, 17.5% CP) from 0 to 56 days in milk (DIM). From 0 to 21 DIM, cows fed FOEA tended ($P<0.1$) to have lower DMI (2.59% BW) and higher BCS (2.57) than cows fed FOER (2.89% BW; 2.34) or FOCA (2.87% BW; 2.42). Cows fed FOER tended ($P<0.1$) to have lower NEFA (464 μEq/L) than cows fed FOEA (603 μEq/L) or FOCA (574 μEq/L). Milk yield (32.6 kg) and BW (634 kg) did not differ ($P>0.05$) among FO diets. CU diet did not alter ($P>0.05$) DMI (2.78% BW), milk yield (32.6 kg), NEFA (548 μEq/L), or BW (635 kg). From 0 to 56 DIM, neither FO nor CU diets affected ($P>0.05$) DMI (3.4% BW), NEFA (336 μEq/L), BW (629 kg), BCS (2.36), or milk yield (37.8 kg). At 1 DIM, liver lipid content tended to be lower ($P<0.1$) for FOER (5.5%) than FOEA (7.0%) or FOCA (6.9%) and tended to be lower ($P<0.1$) for CUR (5.9%) than CUA (7.0%). Liver glycogen content (mean of 1, 14, 28, 49 DIM) did not differ ($P>0.05$) among FO diets (2.9%) but tended to be higher ($P<0.1$) for CUR (3.0%) than CUA (2.7%). Preventing excessive nutrient intake in the FO or CU periods may improve DMI and energy status in the transition period but the effects may diminish as lactation progresses.

Key Words: Transition cow, Nutrient intake, Liver

421 Responses to epinephrine challenges in peripartal Holstein cows fed two amounts of metabolizable protein in prepartum diets. J. P. Underwood*, J. K. Drackley, G. E. Dahl, and T. L. Auchtung, *University of Illinois, Urbana, IL*.

To determine the effects of prepartum dietary metabolizable protein (MP) supply on lipolytic and glucose response to epinephrine stimulus during the periparturient period, 12 nonlactating cows in second or greater pregnancies were assigned to a low MP diet (LMP) formulated to provide 900 g MP/d or a high MP diet (HMP) to provide 1100 g MP/d. Cows received prepartum diets from 28 d before expected parturition to day of parturition, and then received a common lactation diet until 35 d postpartum. Blood was sampled weekly to d -7, daily to d 7, and weekly through d 35 for analysis of glucose, NEFA, BHBA, urea-N, and total protein concentrations. Epinephrine challenges were conducted on d -10 before expected parturition, and d 7 and d 14 postpartum. Epinephrine (1.4 μg/kg BW) was administered via jugular vein and blood was collected from the opposite jugular vein from -45 min to +120 min relative to epinephrine administration. Plasma was analyzed for glucose and NEFA concentrations. Prepartum DMI (14.5 and 12.2 kg/d for LMP and HMP, respectively, P=0.29), postpartum DMI (22.9 and 21.1 kg/d for LMP and HMP, P=0.25), and 4% FCM (37.0 and 36.8 kg/d for LMP and HMP, P=0.95) were similar between diets. Cows fed HMP had higher concentrations of urea-N prepartum (P<0.01) than cows fed LMP (14 vs 9 mg/dL). Cows fed HMP tended (P=0.11) to have greater prepartum concentrations of total protein in plasma than those fed LMP (7.4 vs 6.9 g/dL). Area under the curve (AUC) for NEFA response to epinephrine did not differ between diets (P=0.25) but differed by day (P<0.001) relative to parturition (8,282; 28,854; and 21,027 μeq (L x min) for d -10, d 7, and d 14, respectively). Glucose AUC did not differ between diets or among days (P=0.91). Lipolytic response, but not glucose response, to epinephrine is enhanced during the early postpartum period relative to the late dry period. However, those responses are not affected by prepartum MP supply.

Key Words: Epinephrine, Metabolizable protein, Lipolysis

422 Metabolism of dairy cows as affected by prepartum dietary carbohydrate source and supplementation with chromium throughout the periparturient period. K. L. Smith*[1], M. R. Waldron[1], T. R. Overton[1], J. K. Drackley[2], and M. T. Socha[3], [1]*Cornell University,* [2]*University of Illinois, Urbana,* [3]*Zinpro Corporation, Eden Prairie, MN*.

Holstein cows (n=74) entering second or later lactation were used to determine whether metabolic parameters are affected by source of carbohydrate in the prepartum diet and chromium-L-methionine (CrMet) supplementation throughout the periparturient period. From 21 d before expected parturition until parturition, cows were fed either a TMR with the concentrate portion based on starch-based cereals (NFC) or a TMR with the concentrate portion based on nonforage fiber sources (NFFS). The CrMet was supplemented once daily via gelatin capsule at 0, 0.03, or 0.06 mg/kg $BW^{.75}$. Thus, treatments were in a 2 x 3 arrangement. Feeding NFFS prepartum increased prepartum (60.3, 59.1 mg/dl; P<0.02) and postpartum (46.5, 45.0 mg/dl; P<0.09) plasma glucose concentrations. BHBA concentrations were not different (6.0, 5.9 mg/dl) prepartum, but tended (9.4, 11.0 mg/dl; P<0.12) to be lower postpartum for cows fed NFFS. Liver triglyceride concentrations were greater on d 1 postpartum and lower on d 21 postpartum for NFC (P<0.04). Cows fed NFFS prepartum tended (P<0.10) to have greater postpartum liver glycogen content. Insulin and NEFA did not differ (P>0.15) pre- or postpartum between NFFS and NFC. Supplementing 0.03 mg/kg $BW^{.75}$ of CrMet increased (59.4, 60.9, 58.8 mg/dl; P<0.01) prepartum plasma glucose concentrations and tended (P<0.10) to lower prepartum NEFA concentrations (206, 179, 208 uEq/l) for 0, 0.03, and 0.06 mg/kg $BW^{.75}$. Postpartum plasma glucose decreased linearly (46.7, 46.0, 44.5 mg/dl; P<0.04) and insulin concentrations were affected quadratically (P<0.03) by CrMet (0.21, 0.16, 0.20 pg/ml). Supplementing CrMet did not affect prepartum insulin and BHBA, postpartum NEFA or BHBA, nor liver composition. Overall, prepartum carbohydrate source and CrMet had modest effects on metabolic variables.

Key Words: periparturient cow, carbohydrate, chromium

423 Influence of cobalt supplementation to dry and lactating dairy cow diets with monensin on microbial fermentation in continuous culture. R.L.K. Hulbert*[1], G. I. Crawford[1], K. A. Caperoon[1], M. D. Stern[1], and M. T. Socha[2], [1]*University of Minnesota, St. Paul,* [2]*Zinpro Corporation, Eden Prairie, MN*.

An experiment was conducted to determine if the level of cobalt supplementation to dry and lactating dairy cow diets with monensin would affect fermentation by ruminal microbes maintained in dual flow continuous culture fermenters. A dry cow diet and a lactating cow diet formulated to contain monensin at 200 and 300 mg/h/d, respectively, were supplemented with 0.5, 1, 2, and 4 ppm of cobalt glucoheptonate. These treatments were evaluated in eight flasks inoculated with ruminal fluid from a cannulated cow during four 10-d experimental periods to achieve four replications for each of the eight dietary treatments. The experimental design was a completely randomized 4 x 2 factorial arrangement

of treatments with four concentrations of cobalt glucoheptonate and two diet types (dry and lactating dairy cow diets). Differences *(P < 0.05)* between dry and lactating dairy cow diets, respectively, were observed for pH (6.40 vs 6.12), true OM digestion (42.8 vs 59.3 %), ADF digestion (42.3 vs 50.7 %) and total VFA concentration (75.1 vs 103.8 mM). Neutral detergent fiber digestion (35.0 vs 40.0 %) and total nonstructural carbohydrate digestion (80.9 vs 83.4 %) were similar *(P > 0.05)* between dry and lactating dairy cow diets. Crude protein digestion (22.8 vs 33.7 %) and N flow (2.18 vs 2.88 g/d) were lower *(P < 0.05)* for the dry cow diets compared with the lactating dairy cow diets. Efficiency of bacterial synthesis (20.2 vs 21.6 g of N/kg of OM truly digested) was similar *(P > 0.05)* between diets. There were no effects *(P > 0.05)* of cobalt supplementation on nutrient digestion and microbial fermentation nor were there any interactions *(P > 0.05)* with type of diet. Results indicate that supplementation with cobalt at various concentrations in either a dry or lactating dairy cow diet with monensin did not have any impact on fermentation by ruminal microbes.

Key Words: Cobalt, Continuous culture, Monensin

424 Prediction of urine volume and urinary output of nitrogen and minerals in lactating dairy cows. . T. D. Nennich*[1], J. H. Harrison[1], L. Johnson[1], D. Meyer[2], W. Weiss[3], N. St-Pierre[3], R. L. Kincaid[4], M. Wattiaux[5], and D. L. Davidson[1], [1]*Washington State University, Puyallup,* [2]*University of California, Davis,* [3]*The Ohio State University,* [4]*Washington State University, Pullman,* [5]*University of Wisconsin.*

The objective of this study was to develop prediction equations for estimating urinary volume, nitrogen, and mineral excretion of lactating dairy cows. A data set was assembled from total urine collection studies (n = 25) that used multiparous Holstein cows. The studies were conducted by Washington State University, University of California-Davis, The Ohio State University, and the University of Wisconsin. Metabolizable protein (MP) supply was estimated for each individual cow using the 2001 Dairy NRC Model. Based upon their estimated MP intake, cows were assigned into treatments of LOWMP that included cows with MP supply at 110% or less of their calculated MP requirements, and HIGHMP that included cows with MP supply greater than 110% of MP requirements. Milk production for cows in LOWMP ranged from 9.8 to 86.1 kg/d and 1.4 to 52.6 kg/d for HIGHMP. Dietary crude protein (CP) concentration was 17.1±5.9% and 18.2±5.8% for LOWMP and HIGHMP, respectively. Urinary nitrogen ranged from 63 to 499 g/d for LOWMP and 90 to 436 g/d for HIGHMP. Regression analysis performed using the PROC MIXED procedure of SAS included study as a random variable. The regression equations predict urine volume, urinary nitrogen, and urinary excretion of P, K, Na, Ca, Mg, Cu, and Zn. Predictors used in the equations include days in milk (DIM), body weight (BW), dry matter intake (DMI), dietary CP concentration, milk CP content, and milk urea nitrogen (MUN). The best equation for the prediction of urinary nitrogen (g/d) using the LOWMP data set was: 0.12∗DIM + 0.18∗BW + 4.29∗DMI + 14.47∗diet CP% + 4.35∗MUN # 321 (n = 230) compared to: 0.28∗BW + 4.85∗DMI + 7.95∗diet CP% + 4.62∗MUN + 20.77∗milk CP% - 334 (n = 154) for the HIGHMP data set. Prediction equations can be used to more accurately estimate urinary nitrogen and mineral excretion of lactating dairy cows than current tabular values.

Key Words: Urine, Nitrogen, Dairy cows

Ruminant Nutrition: Feedlot

425 Effect of wintering system and feedlot sorting on performance and economics of yearling steer production systems. J. D. Folmer*[1], C. N. Macken[1], M. P. Blackford[1], G. E. Erickson[1], and T. J. Klopfenstein[1], [1]*University of Nebraska, Lincoln, NE.*

An experiment was conducted to evaluate the effects of different winter management and feedlot sorting on the performance and economics of a yearling steer production system. Two hundred steers (239 kg) were stratified by weight and assigned randomly (n = 100) to one of two winter management strategy treatments. Intensive (INT) or normal (NOR) management strategies consisted of 91 d of winter corn residue grazing (CRG) and 52 d of dry-lot hay feeding with wet corn gluten feed (WCGF) supplementation. NOR steers received 2.27 kg of WCGF DM daily while INT steers received 2.72 kg. INT steers also received Bovatec (170 mg/d) with the WCGF, and were implanted with Ralgro on d 1, and with Synovex S on d 91. All Steers received a Revelor G implant on d 143 and began the summer grazing period. INT steers were placed on feed at d 220 and NOR steers on d 264. At initiation of feedlot finishing, steers were implanted with Revelor S, and stratified by weight and assigned randomly (n = 50) to one of two additional treatments in two replications, sorted (S) or unsorted (U). S steers were divided in to three weight groups, the heavy 25%, the middle 50%, and the light 25%, and marketed at a common fat thickness target of 1.14 cm fat thickness. Heavy steers were marketed 14 d prior, middle 7 d after, and light 21 d after the unsorted control group. Results from the experiment indicate that INT managed steers had greater wintering phase ADG than the NOR managed steers 0.83 vs. 0.68 kg/d, respectively. Feedlot initial weights were 446 kg for INT steers on d 220, and 456 kg for NOR steers on d 264. NOR (P<.01), and S (P<.05) steers had significantly greater ADG, DMI, hot carcass weight (HCW), final weight (FW), and lower feed conversion than INT and U steers. NOR steers had fewer days on feed, while S had additional days on feed. INT steers performed better resulting in heavier, more profitable steers after the wintering phase. NOR steers were heavier and more profitable after the summer grazing and feedlot finishing phases. Sorting steers into marketing groups when they enter the feedlot resulted in heavier, more profitable steers versus unsorted controls.

Key Words: Steers, Systems, Sorting

426 Effects of live cultures of *Lactobacillus acidophilus* (Strains 45 and 747) *Propionibacterium freudenreichii* on performance, carcass and intestinal characteristics, and *Escherichia coli* O157:H7 shedding of finishing beef steers. N. A. Elam*, J. F. Gleghorn, J. D. Rivera, M. L. Galyean, M. M. Brashears, and S. M. Younts-Dahl, *Texas Tech University.*

Two hundred forty beef steers (British and Continental; initial BW = 332.8 ± 23.1 kg) were used to determine the effects of live cultures of *Lactobacillus acidophilus* (LA) and *Propionibacterium freudenreichii* (PF) on performance, carcass and intestinal characteristics, and prevalence of *Escherichia coli* O157:H7 (EC) shedding during the finishing phase. Cattle were fed a steam-flaked corn-based 92% concentrate diet for an average of 170 d. The four treatments included: 1) control (CON) lactose carrier only; 2) 1×10^9 cfu of LA Strain 747 plus 1×10^6 cfu of LA Strain 45 plus 1×10^9 cfu of PF-24 per animal daily (G); 3) 1×10^9 cfu of LA Strain 747 plus 1×10^9 cfu of PF-24 per animal daily (Y); and 4) 1×10^6 cfu of LA Strain 747 plus 1×10^6 cfu of LA Strain 45 plus 1×10^9 cfu of PF-24 per animal daily (B). A randomized complete block design was used with pen as the experimental unit (12 pens/treatment). No differences ($P > 0.10$) among treatments were detected for final BW, DMI, ADG, gain:feed, and hot carcass weight. In addition, dressing percent, longissimus muscle area, fat thickness at the 12^{th} rib, percentage of internal fat, and yield grade did not differ ($P > 0.10$) among treatments. A trend ($P = 0.08$) was detected for treatment differences in ileal lamina propria (LP) thickness. The average LP thickness for Y and G steers was less ($P < 0.05$) than the average for CON and B steers (0.38 vs 0.45 mm). Moreover, Y and G steers had a lower ($P < 0.10$) incidence of EC shedding than CON and B steers. Under the conditions of this study, live cultures of LA plus PF did not greatly affect feedlot performance and carcass characteristics. Some of the cultures used in this study decreased fecal EC shedding, which might be related to the results for ileal LP thickness.

Key Words: Beef Cattle, Direct-fed Microbials, Lamina Propria

427 Influence of sire breed on residual feed intake as an indicator of efficiency in steers. C. L. Ferrell*, T. G. Jenkins, and H. C. Freetly, *USDA, ARS, U.S. Meat Animal Research Center, Clay Center, NE.*

The objective was to evaluate residual feed intake (RFI) as an indicator of efficiency. Steers (107) sired by Angus (A), Hereford (H), Belgian