year had terminal records and 80% of these included an indication of disposition. Reporting was similar across years and herd sizes. Distribution of disposals was fairly constant across herd sizes; however, deaths and culling for low production were more common in larger herds while culling for reproductive problems was more common in smaller herds. These results indicate that termination codes can be useful indicators for several important traits.

Key Words: Culling, Disposal, Termination Code

Ruminant Nutrition: Dairy—Transition Cows

317 Effect of transition diet on production performance and metabolism in periparturient dairy cows. J. Guo*, R. Peters, and R. Kohn, *University of Maryland, College Park.*

The objectives of this study were to characterize the homeorhetic change in blood metabolites and to evaluate the effect of transition diet on ketone body accumulation in periparturient cows. Twenty-eight multiparous Holstein cows were listed in order of their anticipated due dates and assigned randomly to one of two groups: with or without a transition diet. The control group received a non-lactating cow diet (1.54 Mcal NEl/kg, 10.9% CP, 53.1 % NDF) from 28 d before expected parturition, and a lactation diet (1.77 Mcal NEl/kg, 16.8% CP, 29.9 % NDF) after parturition. The treatment group received a transition diet (1.71 Mcal/kg of net energy for lactation (NEL), 16.8% of crude protein (CP), 35.2 % of neutral detergent fiber (NDF)) from 14 d before expected parturition to 14 d after calving and were fed the same diets as the cows in control group during the rest of the experimental period. Blood from coccygeal vein was sampled three times per week from 21 d before expected parturition to 21 d postpartum for analysis of glucose, nonesterified fatty acid (NEFA), βhydroxybutyrate, acetoacetate, acetone, and glycerol. Feeding a transition diet resulted in greater area under the curve (AUC) for glucose in the last 17 days of gestation, but no effect within the first 21 days in milk. Acetoacetate AUC was greater for treatment cows than for control cows across the first 21 days in milk. The AUC of NEFA and glycerol between day 15 and day 21 postpartum (after treatment) were greater for treatment cows than that for control cows. Production performance was not affected by transition diet. Plasma glycerol may be an important contributor to gluconeogenesis during the periparturient period. Feeding a transition diet around parturition was associated with greater mobilization of adipose tissue and greater exposure to ketone bodies in early lactation.

Key Words: Periparturient Cow, Ketone Body, Glycerol

318 Microarray analysis of the immunoregulatory actions of OmniGen-AF in periparturient dairy cattle. Y. Wang*[1], J. Burton[2], and N. Forsberg[1], [1]*Oregon State University, Corvallis*, [2]*Michigan State University, East Lansing*.

The goals of this study were to evaluate the mechanisms by which OmniGen-AF, a novel immunoregulatory feed additive, augments innate immunity in dairy cattle. To accomplish this, we assessed effects of OmniGen-AF on neutrophil gene expression using microarray analysis. Eight periparturient Jersey cows were used in this experiment. Four were assigned to a control diet and 4 were assigned to an OmniGen-AF-supplemented diet for 28 days prior to expected parturition. At 12-15 hours after parturition, a time which corresponds to immunosuppression in dairy cattle, blood samples (400 mL) were drawn from the jugular vein and neutrophils were purified using Percoll gradient centrifugation. RNA was isolated using Trizol and the quality of resulting RNA samples was evaluated using an Agilent BioAnalyzer. Of the eight RNA samples prepared, six (three per treatment) were of good quality. RNA from these six samples was reverse transcribed with Cy3 and Cy5 dyes and hybridized to BoTL-5 arrays. Differences in gene expression for the 1500 BoTL-5 genes were evaluated statistically following LOESS normalization. Twenty genes were differentially-regulated (P<0.05) by the addition of OmniGen-AF to the diet. Two of these (interleukin-1-beta-converting enzyme [ICE] and IL-4 receptor) were confirmed using quantitative RT-PCR. Expression of beta-actin was unaffected (P>0.05) by OmniGen-AF. Of interest, we have noted in previous sheep studies that OmniGen-AF increased concentrations of neutrophil IL-1B. Increased expression of ICE, as determined in this study, may explain how OmniGen-AF increased sheep neutrophil IL-1B. Several of the genes up-regulated by OmniGen-AF are involved in control of apoptosis. We have determined, again in sheep studies, that OmniGen-AF increases (P<0.05) neutrophil concentration in blood. A portion of its action, therefore, may arise from its ability to reduce programmed cell death in neutrophils.

Acknowledgements: Center for Animal Functional Genomics, Michigan State University

Key Words: OmniGen-AF, Microarray, Dairy

319 Effect of CLA dose on milk production in early lactation dairy cows. M. J. de Veth*[1], W. M. van Straalen[2], W Koch[1], T. Keller[1], R. Hayler[1], and A. - M. Pfeiffer[1], [1]*BASF-AG, Offenbach, Germany*, [2]*Schothorst Feed Research B.V., Lelystad, The Netherlands*.

Rumen protected fat supplements containing the *trans*-10, *cis*-12 conjugated linoleic acid (CLA) isomer have been shown to be an efficient tool to reduce milk fat synthesis. In addition increased milk yield has been observed in some early lactation studies with CLA. The objective of this study was to evaluate the response at four levels of CLA dose during the first 13 weeks of lactation. Holstein cows (n = 64) were randomly allocated at calving to one of four levels of CLA dose: 0, 5 10, and 15 g/d of *trans*-10, *cis*-12 CLA. The CLA was administered in a lipid-encapsulated form and contained *cis*-9, *trans*-11 and *trans*-10, *cis*-12 isomers at the same ratio. CLA was top dressed once daily. Over the 13 wk treatment period increasing levels of CLA supplementation reduced linearly milk fat content (4.04, 3.61, 3.60 and 3.39% for 0, 5, 10 and 15 g/d *trans*-10, *cis*-12 CLA, respectively; $P < 0.05$) and milk fat yield ($P < 0.05$). The decline in milk fat content from the onset of lactation was gradual, with a nadir not reached until week 5 of lactation. Increased milk yield (6.0, 9.5, 10.5%, $P < 0.01$) and milk lactose yield ($P < 0.05$) was observed with increasing CLA dose, however, milk protein yield was only numerically increased. In addition, DMI, body weight and BCS were unaltered by CLA treatment. The proportion of those fatty acids originating from *de novo* fatty acid synthesis declined with increasing CLA dose. Milk fatty acid content of *trans*-10, *cis*-12 CLA increased linearly ($P < 0.001$) with dose of CLA from <0.001% at 0 g/d *trans*-10, *cis*-12 CLA to 0.04% with 15 g/d *trans*-10, *cis*-12 CLA. Efficiency of transfer of *trans*-10, *cis*-12 CLA into milk fat averaged 2.9% across doses, which is distinctly lower than that reported when CLA is abomasally infused. Overall, results demonstrate that CLA supplementation to early lactation cows will increase milk yield as well as reduce the content of milk fat in a dose dependent manner.

Key Words: Conjugated Linoleic Acid, Milk Fat Depression, Early Lactation

320 Dietary L-carnitine alters hepatic fatty acid metabolism and decreases liver lipid in periparturient Holstein cows. D. B. Carlson*[1], N. B. Litherland[1], J. W. McFadden[1], A. D'Angelo[1], J. C. Woodworth[2], and J. K. Drackley[1], [1]*University of Illinois, Urbana*, [2]*Lonza, Inc., Fair Lawn, NJ*.

Our hypothesis was that supplemental L-carnitine would increase oxidation and decrease esterification of fatty acids in liver, thus decreasing peripartal lipid accumulation. Multiparous Holstein cows (n=56) were supplemented with four amounts of Carniking (50% L-carnitine; Lonza, Inc.), mixed with 227 g ground corn plus 227 g dried molasses, as a topdress from d 14 before expected calving date (ECD) until 21 days in milk. Treatments were: control (CON; 0 g L-car-

nitine), low (LC; 6 g L-carnitine), medium (MC; 50 g L-carnitine), and high (HC; 100 g L-carnitine). All cows were fed the same basal prepartum (21 d before ECD) and postpartum diets (calving until d 56). Liver was biopsied on d 21 before ECD (covariate), and at d 2, 10, and 28. Liver slices were incubated with [1-^{14}C] palmitate (PALM) to determine conversion of PALM to CO_2, acid-soluble products (ASP), and esterified products (EP). Orthogonal contrasts were used to compare carnitine treatments vs. CON; LC vs. MC and HC; and MC vs. HC. Carnitine did not alter conversion of PALM to CO_2. Conversion of PALM to ASP was increased by carnitine compared with CON (P<0.01); MC and HC caused higher ASP production than LC (P<0.01), but MC was higher than HC (P=0.03). Conversion of PALM to EP was lower in carnitine-fed cows vs. CON (P<0.01); both MC and HC reduced PALM conversion to EP compared with LC (P<0.01), and HC was lower than MC (P=0.04). Total liver lipid content (% wet tissue) was lower (P<0.01) in carnitine-fed cows than in CON (7.5, 6.1, 5.1, and 4.3% at d 2 and 9.5, 6.0, 5.2, and 5.3% at d 10 for CON, LC, MC, and HC). Supplemental L-carnitine is effective in decreasing liver lipid content in periparturient cows; in vitro data are consistent with a role for carnitine to stimulate oxidation and decrease esterification of fatty acids.

Key Words: L-Carnitine, Liver, Fatty Acid Metabolism

321 Influence of dietary L-carnitine on production and metabolism during the periparturient period in Holstein cows. D. B. Carlson*[1], N. B. Litherland[1], J. W. McFadden[1], J. C. Woodworth[2], and J. K. Drackley[1], [1]*University of Illinois*, *Urbana, IL*, [2]*Lonza, Inc.*, *Fair Lawn, NJ*.

Our objectives were to determine if varying amounts of dietary L-carnitine would influence milk production and serum concentration of nonesterified fatty acids (NEFA) during the transition period. Multiparous Holstein cows (n=56) were supplemented with four amounts of Carniking (50% L-carnitine; Lonza, Inc.), mixed with 227 g ground corn plus 227 g dried molasses, as a topdress from d 14 before expected calving date (ECD) until 21 days in milk. Treatments were: control (CON; 0 g L-carnitine), low (LC; 6 g L-carnitine), medium (MC; 50 g L-carnitine), and high (HC; 100 g L-carnitine). All cows were fed the same basal prepartum (21 d before ECD) and postpartum diets (calving until d 56). Orthogonal contrasts were used to compare carnitine treatments vs. CON; LC vs. MC and HC; and MC vs. HC. Carnitine supplementation did not affect pre- or postpartum dry matter intake (DMI), but HC reduced DMI at wk 1 and 2 of lactation compared with CON and LC (treatment x time, P<0.05). During wk 1 to 8 of lactation, milk yield was 39.0, 36.6, 37.0, and 32.6 kg/d for CON, LC, MC, and HC, respectively. Milk yield for HC tended to be lower than for MC (P=0.08), whereas LC did not differ from MC and HC (P=0.40). Milk fat percentage (4.00, 3.98, 4.35, and 4.55%) was higher for MC and HC compared with LC (P=0.03), but MC and HC did not differ (P=0.42). L-Carnitine did not alter milk lactose concentration vs. CON (P=0.20), but HC was lower than MC (P=0.01). Yield of 3.5% fat-corrected milk was not affected by carnitine. Pre- and postpartum serum NEFA concentration, body weight, and body condition score were not altered by carnitine supplementation during the transition period. Supplementation of 100 g/d of L-carnitine negatively affected DMI and milk yield during early lactation, however, moderate amounts (6 and 50 g/d) did not affect DMI or milk yield.

Key Words: L-Carnitine, Metabolism, Periparturient Period

322 Effect of dietary inclusion of cane molasses in dry cow diets on prepartum and postpartum performance. W. F. Miller*, J. E. Shirley, J. M. Rottinghaus, E. C. Titgemeyer, and D. E. Johnson, *Kansas State University*, *Manhattan*.

Primiparous (13) and multiparous (18) Holstein dairy cows were used in a randomized complete block design to determine the effects of offering cane molasses during a 60 day dry period on pre- and postpartum performance. Treatment structure was a 2 x 2 factorial with parity and molasses as main effects. Treatments were no molasses (NM) and molasses (M). Far-off dry cow diets (fed d60 to d31 prepartum) contained on a DM basis 6.4% alfalfa hay, 56.3% prairie hay, 13.0% corn silage, 9.7% wet corn gluten feed, 6.7% solvent soybean meal, 3.2% whole linted cottonseed, 1.5% mineral/vitamin premix, and either 3.2% cane molasses (53.4% invert sugars) or corn grain. Close-up dry cow diets (fed d30 to parturition) contained on a DM basis 9.0% alfalfa hay, 13.1% corn silage, 36.8% prairie hay, 12.0% wet corn gluten feed, 13.1% corn grain, 5.8% solvent soybean meal, 1.3% menhaden fish meal, 5% whole linted cottonseed, 1.4% mineral/vitamin premix, and either 3.3% cane molasses or 3.3% additional corn grain. Diet x parity interaction was not significant, thus data for primiparous and multiparous were analyzed collectively. Cows fed molasses during the dry period tended (P= 0.093) to consume more DM during the close-up period (15.5 kg/d vs. 13.9 kg/d) and consumed 7% more DM during the first 30d postpartum. Milk yields during the first 30d postpartum for primiparous and multiparous cows fed NM and M were 30.6, 33.0, 41.1, and 47.3 kg/day, respectively, and tended (P= 0.079) to be higher for cows fed M. Components in milk and component yields were similar from cows consuming NM and M diets. Urea nitrogen tended (P= 0.086) to be higher in milk from cows fed diet M. Body weight and body weight change was similarly affected by NM and M pre- and postpartum. Postpartum loss of body condition tended (P= 0.079) to be greater for cows fed NM. Feeding cane molasses had a tendency to increase DMI during the prepartum period and improve milk yield during the first 30 days of lactation.

Key Words: Molasses, Prepartum, Dairy Cow

323 Effects of varying transition diets fed to Holstein cows at two body condition scores on plasma concentrations of IGF-1 in late pregnancy and early lactation. T. Moyes*[1], C. Stockdale[2], S. Humphrys[3], and K. Macmillan[1], [1]*The University of Melbourne*, *Werribee, Victoria, Australia*, [2]*Department of Primary Industries*, *Kyabram, Victoria, Australia*, [3]*Primegro Ltd*, *Thebarton, South Australia, Australia*.

The objectives of the study were to measure the effects of offering transition diets of varied energy and protein content during the final 3 weeks prepartum on plasma concentrations of IGF-1 in late pregnancy and early-lactation. Sixty multiparous Holstein cows at either Body Condition Score (BCS) 4 or 6 (on a 1 to 8 scale) at enrollment 4 weeks before due calving dates were fed one of 3 diets for the last 3 weeks prepartum. The 3 diets were: i) a standard total mixed ration (TMR) (81.1 MJ ME/cow/d); ii) the TMR + 4 kg of grain concentrate (94.5 MJ ME/cow/d; high energy); and iii) the TMR + 3.5 kg of soybean meal (115.9 MJ ME/cow/d; high protein). Cows received a common diet after calving of pasture offered at 35 kg DM/cow/d and supplemented with 3 kg DM of grain concentrate (11.8 MJ ME/kg DM) each milking for 10 weeks into lactation. Plasma concentrations of IGF-1 were measured weekly throughout this time. Daily milk yields and the interval to first postpartum ovulation (IFO) were also measured. Peak plasma concentrations of IGF-1 ranged from 200 ng/ml (high protein) to 145 ng/ml (standard and high energy; $P < 0.001$) during the treatment period before decreasing rapidly from 1 week (high protein) to 2 weeks (standard and high energy) before calving. Similar minimum concentrations of IGF-1 (65 ng/ml; $P > 0.20$) were measured 1 week after calving before increasing to a common plateau value (100 ng/ml; $P > 0.5$) by 7 weeks. Cows with BCS 6 at enrollment had higher plasma concentrations of IGF-1 at that time (210 vs. 140 ng/ml; $P < 0.005$), but not by 1 week before calving or thereafter ($P > 0.7$). Neither milk yield nor IFO was affected by prepartum treatments. The trial showed that differences in plasma concentrations of IGF-1 associated with a range of transition diets fed to cows of differing BCS did not affect IGF-1 concentrations in early lactation in Holsteins fed a pasture-based diet.

Key Words: Insulin-Like Growth Factor-1, Transition Diet, Body Condition Score

324 The effect of precalving DMI on milk production is dependent on DMI in early lactation in grazing dairy systems. J. R. Roche*, *Dexcel, Hamilton, New Zealand*.

Sixty-eight multiparous grazing dairy cows (BW:523±62.6kg) were randomly allocated to two precalving pasture DMI for 29±7.7 days precalving (Low or High; 4.8 and 11.9 kg DM). At calving, cows in each precalving treatment were randomly allocated to one of two levels of feeding (Low or High; 8.6 and 13.5 kg DM) for 35 d postcalving in a 2x2 factorial arrangement. Following treatment all cows grazed together and were offered generous allowances of pasture and pasture silage. Daily milk yields were recorded, and fat, protein and lactose concentrations determined each wk for 15 wk. Blood was sampled regularly pre- and postcalving and analyzed for indicators of energy status, growth hormone (GH) and IGF-1. Data was analyzed by ANOVA for a factorial arrangement of treatments. Precalving restriction reduced (P<0.05) milk fat production by 8.4% during the first five weeks postcalving, but differences were not evident subsequently. In comparison, postcalving feed restriction reduced (P<0.001) yield of milk, fat and protein by 25, 21 and 28%, respectively, during the first five weeks postcalving. Decreased (P<0.01) yields of milk, fat and protein (12, 10 and 9%, respectively) were also evident for ten weeks after the feed restriction finished. There was a tendency (P=0.13) for a precalving x postcalving DMI interaction in milk component (fat and protein) yield during the first five weeks of lactation. High-High cows produced 7.1 kg more fat and protein than Low-High cows, but there was no effect of precalving level of feeding in cows that were restricted postcalving. The plasma concentration of NEFA, BHBA and GH were elevated (P<0.01) in restricted cows precalving and IGF-1 concentration declined. Plasma NEFA and BHBA concentrations were elevated (P<0.01) postcalving in restricted cows, but postcalving DMI did not affect GH or IGF-1 concentrations. The milk production gains from higher levels of feeding precalving are only realized when cows are fed well after calving in pasture-based systems. Irrespective, the effect of precalving DMI on postcalving milk production was small.

Key Words: Transition Cow, Pasture, Dry Matter Intake

Ruminant Nutrition: Dairy and Beef—Minerals

325 Dietary cation-anion difference and dietary protein effects on performance and acid-base status of dairy cows in early lactation. W. Hu*[1], M. R. Murphy[1], P. D. Constable[1], and E. Block[2], [1]*University of Illinois, Urbana*, [2]*Church & Dwight Co., Inc., Princeton, NJ*.

Our objective was to examine the effects of dietary cation-anion difference (DCAD) with different concentrations of dietary protein (CP) on performance and acid-base status in early lactation cows. Six lactating Holstein cows averaging 44 days in milk were used in a 6 × 6 Latin square design with a 2 × 3 factorial arrangement of treatments: DCAD of -3, 22, or 47 meq (Na + K - Cl - S)/100 g of dry matter (DM), and 16 or 19% CP (on a DM basis). Linear increases with DCAD occurred in DM intake (24.4, 25.9, and 27.6 kg/d; $P < 0.01$), milk fat percentage (2.99, 3.36, and 3.59%; $P = 0.01$), 4% fat-corrected milk production (30.7, 32.8, and 34.2 kg/d; $P = 0.01$), milk protein (3.11, 3.18, and 3.24%; $P < 0.01$), milk lactose (4.81, 4.78, and 4.90%; $P = 0.03$), milk total solids (11.92, 12.45, and 12.65%; $P = 0.01$), blood pH (7.387, 7.404, and 7.416; $P < 0.01$), and jugular venous HCO_3^- concentration (25.7, 27.5, and 28.3 mmol/l; $P < 0.01$). Milk production itself was unaffected by DCAD (36.0, 36.1, and 36.4 kg/d; $P > 0.10$) and whole blood Cl concentration decreased linearly with increasing DCAD (100.1, 98.9, and 97.5 mmol/l; $P < 0.01$). Cows fed 16% CP had lower milk urea N than cows fed 19% CP (14.8 and 20.7 mg/dl; $P < 0.01$); the same was true for plasma urea N (17.3 and 24.3 mg/dl; $P < 0.01$). Dry matter intake, milk production and milk composition, and acid-base status did not differ between 16 and 19% CP treatments. The DCAD affected DM intake and performance of dairy cows in early lactation, effects likely mediated by modification of acid-base status of the cows; however, these variables were not affected when early lactation cows were fed either 16 or 19% CP diets.

Key Words: Dietary Cation-Anion Difference, Dietary Protein, Performance

326 Dietary cation-anion difference effect on performance and acid-base status of dairy cows in early lactation. W. Hu*[1], M. R. Murphy[1], P. D. Constable[1], and E. Block[2], [1]*University of Illinois*, *Urbana*, [2]*Church & Dwight Co., Inc.*, *Princeton, NJ*.

Our objective was to examine the effect of dietary cation-anion difference (DCAD) on performance and acid-base status of cows in early lactation. Sixteen Holstein and 8 Jersey cows were used immediately after calving to compare two DCAD [22 and 47 meq (Na + K - Cl - S)/100 g of dry matter (DM)] in a completely randomized design. The corn silage based diets contained 19.0% crude protein, 25.4% neutral detergent fiber, 15.0% acid detergent fiber, and 1.69 Mcal of NE_L/kg (on a DM basis). An additional 2.3 kg of alfalfa hay was fed during the first 5 d postpartum then milk, blood, and urine samples were collected for 6 wk. Repeated-measures, with an extra between-subject effect, mixed model analysis indicated that DCAD did not affect ($P > 0.15$) DM intake (18.2 and 18.3 kg/d), milk production (33.5 and 33.3 kg/d), milk composition (3.96 and 4.11% fat, 3.11 and 3.00% protein, and 8.95 and 8.83% SNF), jugular venous HCO_3^- concentration (27.3 and 27.6 mmol/l), or pCO_2 (43.2 and 42.8 mmHg). Urinary pH increased with DCAD (8.12 and 8.20, $P = 0.08$), as did urinary Na:creatinine (1.08 and 1.57, $P = 0.01$) and K:creatinine (2.56 and 3.62, $P < 0.01$). Blood pH tended to increase as DCAD increased (7.421 and 7.428, $P = 0.11$); whereas, whole blood Cl concentration decreased as DCAD increased (98.8 and 97.6 mmol/l, $P = 0.06$). Intake of DM and performance of cows in early lactation were not improved when DCAD increased from 22 to 47 meq/100 g of DM.

Key Words: Dietary Cation-Anion Difference, Performance, Acid-Base Status

327 Utilization of phosphorus in lactating cows fed varying amounts of phosphorus and sources of fiber. Z. Wu*, *Pennsylvania State University.*, *University Park*.

The effect of dietary P content and fiber source on P utilization in dairy cows was determined using the following 4 dietary treatments formed in a 2 x 2 factorial arrangement: low P, alfalfa hay (LPAH); low P, soyhulls (LPSH); high P, alfalfa hay (HPAH); and high P, soyhulls (HPSH). The P content was 0.32 or 0.44%, and the fiber source was varied by substituting 10% soyhulls for 6% alfalfa hay on a DM basis. Diets also contained approximately 50% corn silage and alfalfa silage for all treatments. The diets were fed to 32 Holsteins (97 ± 19 DIM) for 10 wk. Milk yield was 42.1 and 44.0 kg/d, fat 1.553 and 1.790 kg/d, and protein 1.240 and 1.323 kg/d, for the 0.32 and 0.44% P diets, respectively. Differences in milk production were associated with 1.5 kg/d less DMI for the lower P diets on average. Increasing dietary P increased fecal P excretion. Partial substitution of soyhulls for alfalfa hay did not affect milk production, but resulted in less fecal P excretion. Based on lactation performance 0.32% P appeared inadequate for cows milking 43 kg/d, while the requirement was 0.37%, calculated according to the 2001 NRC. Using highly digestible nonforage fiber sources in place of forage fiber sources in the diet may reduce fecal P excretion.