

($P=0.0007$) and tetracycline ($P=0.0441$). There was no significant association between year and proportion of *Strep sp.* resistant to ampicillin ($P=0.22$), cephalothin ($P=0.337$), erythromycin ($P=0.07$), lincomycin ($P=0.95$), penicillin ($P=0.21$), pirlimycin ($P=0.13$), sulfa ($P=0.37$) and SXT ($P=0.78$). Year was significantly associated with proportion of *E. coli* resistant to cephalothin and sulfa ($P=0.0006$). There was no significant association between year and proportion of *E. coli* resistant to ampicillin ($P=0.10$), SXT ($P=0.49$) and tetracycline ($P=0.10$). Some variation was noted in the antimicrobial resistance of these pathogens.

Key Words: Antibiotic, Antimicrobial resistance, Mastitis

85 Effects of storage time and thawing methods on the recovery of *Mycoplasma* in milk samples from cows with intramammary infections. M. Biddle*, L. Fox, M. Evans, and C. Gaskins, *Washington State University*.

This study was executed to determine the effects of storage and thawing on the viability of *Mycoplasma species* in cow#s milk. The trial was designed using a control sample and seven treatments subjected to two methods. Treatments 1, 2, 3 and 4 were the same sample repeatedly frozen and thawed for 4 weeks starting on Week 1 after collection. Thawing, plating, and refreezing of this sample were repeated on Weeks 2, 3, and 4, after original collection. Treatments 5, 6, and 7 were three individual samples stored for varying lengths of time. Treatment 5 samples were stored for two weeks and a portion plated on Week 2. Treatment 6 samples were stored for three weeks and plated on Week 3. Treatment 7 samples were stored for four weeks and plated on Week 4. There was a significant treatment effect ($p < 0.0001$) on the recovery of colony forming units (CFU) in milk samples when comparing the control sample to Treatments 1 through 7. There was a linear decline in mean number of CFU in samples that were repeatedly frozen and thawed. Control sample CFU was 6.29, Treatment 1 CFU 4.64, Treatment 2 CFU 3.69, Treatment 3 CFU 3.01, and Treatment 4 CFU 1.86. A linear decline in mean number of CFU was also present for milk samples that were stored for varying lengths of time. Treatment 5 CFU was 4.41, Treatment 6 CFU 4.13, and Treatment 7 CFU 3.18 which are 2-3 fold log reductions in comparison to the control sample. To determine the best thawing method, Treatment 1 through 7 samples, previously split, were thawed using two methods. In Method 1, samples were thawed at ambient temperature for one-half hour. In Method 2, samples were thawed at 37°C in a water bath. More mycoplasma were recovered from milk samples thawed at ambient temperature than milk samples thawed in a 37°C water bath ($p < 0.0001$). In comparing mean numbers of CFU, Method 1 CFU was 4.04 and Method 2 CFU was 3.76. A final comparison was made between individual treatments. All treatments were significant ($p < 0.0001$), with the exception of the Treatment 5 to Treatment 6 pairwise comparison. The results of this study indicate that storage and thawing of milk samples is harmful to mycoplasma organisms.

86 Performance of lactating dairy cows fed gamagrass as hay or silage. J-S. Eun*¹, V. Fellner¹, J. C. Burns², and M. L. Gumpertz¹, ¹*North Carolina State University, Raleigh, NC, USA*, ²*USDA-ARS, Raleigh, NC, USA*.

Twenty lactating Holstein cows were used to determine feeding value of gamagrass as hay or silage and effect of supplemental corn on gamagrass silage utilization. Cows were grouped by DIM, milk yield, and parity into 5 groups. Each group was assigned to one of 5 dietary treatments: 1) gamagrass hay (GH), 2) gamagrass silage (GS), 3) GS + low corn (GSLC), 4) GS + medium corn (GSMC), and 5) GS + high corn (GSHC). A protein supplement mix was offered to all cows to keep crude protein levels similar across treatments. All silage diets were offered for 6 weeks and hay was offered for 3 weeks. Data were analyzed according to a completely randomized design using the proc GLM procedure

of SAS. Feeding gamagrass as hay or silage did not change milk yield. Compared to gamagrass silage, feeding supplemental corn increased milk yield but only at the medium and high levels of corn inclusion ($P < 0.05$). Milk fat, protein, and lactose contents were similar across all treatments; there was a tendency for milk protein to be higher with GSHC diet ($P < 0.07$). Yields of milk fat, protein, and lactose tended to be higher with GS compared with GH and corn supplementation supported higher yields when compared to gamagrass silage. Gamagrass fed as silage resulted in a higher feed conversion efficiency compared to gamagrass fed as hay ($P < 0.01$). Including corn with the silage resulted in a lower feed efficiency with GSHC being the lowest. Conversion of feed N to milk N was greater with gamagrass fed as silage compared to hay ($P < 0.01$) and supplementation of GS with corn failed to improve N efficiency. Milk urea nitrogen (MUN) was significantly higher ($P < 0.01$) for cows fed GH compared to all other treatments. Feeding GS significantly lowered MUN, and corn supplementation at the medium and high levels further reduced MUN ($P < 0.05$). Milk lipid profile was similar between GH and GS. Supplementing corn at the high level increased C_{18:0}, trans-C_{18:1}, and C_{18:2} contents. Gamagrass silage supported similar milk yield compared to gamagrass hay. Increased energy from supplemental corn increased milk yield and tended to increase conversion of feed N into milk protein. Gamagrass fed as silage without or with corn improved the N status of the cows as indicated by lower MUN concentrations.

Key Words: Gamagrass, Corn, Dairy cows

87 Dietary cation-anion difference and K:Na ratio effect on performance of lactating dairy cows during hot weather. C.D. Wildman*, J.W. West, and J.K. Bernard, *The University of Georgia, Tifton, GA*.

Forty-two lactating Holstein cows averaging 187.6 DIM ($\pm 58.5d$) were used in an 8 wk trial to determine the response to dietary K:Na ratio and dietary cation-anion difference (DCAD) levels fed during hot weather. The study duration was June 6 through July 31. Mean maximum and minimum temperature, relative humidity, and temperature-humidity index (THI) were 31.2 and 22.6°C; 95.8 and 58.8%; and 85.9 and 75.3. Treatments were arranged as a 2x3 factorial within a randomized block design to provide 30 or 45 meq/100g DM (Na + K - Cl - S) and 2:1, 3.5:1, and 5:1 K:Na ratios using sodium bicarbonate and potassium carbonate to modify diets. Intake of DM, energy-corrected milk yield, fat percentage, and protein percentage for low and high DCAD and low, moderate, and high K:Na ratios were 22.8, 22.8, 15.2, 17.1 mg/dl; 22.1, 22.5, 22.1, 21.9, 22.8 mmol/L; 94.7, 106.1, 102.6, 100.6, 97.9 mmol/L; 147.8, 147.5, 147.5, 147.6, 147.8 mmol/L; 4.9, 4.8, 4.7, 4.8, 4.9 mmol/L; 99.5, 110.6, 141.9, 105.4, 67.9 mmol/L; 128.8, 153.7, 116.2, 148.2, 159.4 mmol/L. A significant effect of DCAD was seen for BUN ($P < .01$). A significant ratio effect was seen for urinary K and Na ($P < .10$). There was a tendency toward a DCAD effect for urinary bicarbonate ($P < .11$). No other main treatment effects were seen. Results suggest that sufficient blood buffering existed with the lower DCAD diet, with additional cation and bicarbonate being excreted in the urine.

Key Words: Dietary Cation-Anion Difference, Electrolytes, Heat stress

Graduate Paper Competition Northeast ASAS/ADSA Section

88 Potential mechanisms for increased milk yield due to increased milking frequency during early lactation. S. A. Hale*¹, A. V. Capuco², and R. A. Erdman¹, ¹*University of Maryland, College Park*, ²*USDA-ARS, Beltsville, MD*.

Increased milking frequency (IMF) at the beginning of lactation has been shown to increase milk yield not only during IMF but also after its cessation. This experiment evaluated the immediate effects of IMF

initiated during early lactation, on mammary growth and long-term effects on milk yield. Thirty-one cows were divided into three treatment groups: 1) controls: cows milked twice daily (2X) beginning at parturition (d 1), 2) IMF1: cows milked four times daily (4X) from d 1 to 21 postpartum (pp) and 3) IMF4: cows milked 2X d 1 to 3 and 4X d 4 to 21 pp. The 4X cows were milked immediately before 2X cows and again 3 h later, at the end of the normal milking routine. All cows were

milked 2x from d 21 to 305 pp. Milk yields were 33.7, 42.3 and 38.3 kg/d during wk 1 to 3 ($P < 0.02$) and 36.1, 39.0 and 38.8 kg/d during wk 4 to 40 ($P < 0.04$) for control, IMF1 and IMF4, respectively. Mammary biopsies from four cows per treatment were obtained on d 7 and 14 pp to evaluate mammary cell proliferation. Tritiated-thymidine incorporation tended to increase on d 7 in IMF1 cows ($P = 0.09$), and arithmetic means of the percentage of cells expressing Ki67 proliferation antigen ($P > 0.1$) were consistent with a proliferative response to IMF. Blood was sampled three times per wk during the first 2 wk and then once per wk during wk 3,4,5,6,8 and 10. Plasma IGF-1 averaged 20.1 ng/ml in IMF cows vs. 24.2 in controls ($P < 0.05$) but was not accompanied by a change in GH ($P > 0.50$). Prl was also not affected by treatment ($P > 0.50$). Neither milk yield nor a potential effect on mammary cell proliferation were correlated with systemic IGF-1. However changes in local IGF-1 and its binding proteins cannot be discounted. Increasing milking frequency for a short time during early lactation increased milk yield that persisted for most of lactation. Furthermore, increasing milking frequency during early lactation may have a proliferative effect on the mammary epithelium, which would account for the persistent increase in milk yield. Keywords: milking frequency, mammary growth, IGF-1

Key Words: Milking frequency, Mammary growth, IGF-1

89 Performance of dairy cows as affected by prepartum dietary carbohydrate source and supplementation with chromium throughout the periparturient period. K. L. Smith^{*1}, M. R. Waldron¹, T. R. Overton¹, J. K. Drackley², and M. T. Socha³, ¹Cornell University, Ithaca NY, ²University of Illinois, Urbana, ³Zinpro Corporation, Eden Prairie, MN.

Holstein cows (n=74) entering second or later lactation were used to determine whether production and DMI are affected by source of carbohydrate in the prepartum diet and chromium-L-methionine (CrMet) supplementation throughout the periparturient period. Cows were fed either a TMR with the concentrate portion based on starch-based cereals (NFC; 1.63 Mcal/kg NE_L, 14.5% CP, 41.3% NFC) or a TMR with the concentrate portion based on nonforage fiber sources (NFFS; 1.59 Mcal/kg NE_L, 14.3% CP, 34.5% NFC) from 21 d before expected parturition until parturition. After parturition all cows were fed a lactation TMR (1.74 Mcal/kg NE_L, 17.8% CP, 39.9% NFC). The CrMet was supplemented once daily via gelatin capsule at dosages of 0, 0.03, or 0.06 mg/kg BW^{0.75}. Thus, treatments were in a 2 (carbohydrate source) x 3 (CrMet) arrangement. Neither prepartum nor postpartum DMI was affected by treatment ($P > 0.15$). Milk yield tended ($P < 0.06$) to be increased linearly by CrMet supplementation. Percentages of fat ($P < 0.12$) and total solids ($P < 0.06$) in milk tended to be decreased for cows fed the NFFS diet prepartum. These data indicate that prepartum carbohydrate source has little influence on performance during the immediate periparturient period, and that trends for increased milk yield for cows supplemented with CrMet are independent of prepartum dietary carbohydrate source.

Item	NFC			NFFS			SEM
	0 ¹	0.03 ¹	0.06 ¹	0 ¹	0.03 ¹	0.06 ¹	
Prepartum DMI ²	13.7	13.5	13.4	13.5	14.3	13.9	0.44
Postpartum DMI ²	17.6	18.2	19.0	18.2	19.5	19.7	0.82
Milk ²	39.5	39.7	41.9	40.4	41.4	43.7	1.6
Fat, %	4.39	4.54	4.54	4.47	4.28	4.12	0.16
Fat ²	1.70	1.76	1.86	1.76	1.76	1.76	0.06
Protein, %	3.50	3.41	3.11	3.14	3.32	3.19	0.15
Protein ²	1.33	1.30	1.27	1.23	1.34	1.36	0.08
Solids, %	13.44	13.60	13.26	13.30	13.18	12.79	0.23
Solids ²	5.23	5.31	5.49	5.30	5.43	5.52	0.20

¹CrMet dose (g/kgBW^{0.75}) ²kg/d

Key Words: Periparturient Cow, Carbohydrate, Chromium

90 Evaluation of ruminally unprotected lysine as a source of metabolizable lysine for high producing cows. A. M. McLaughlin^{*1}, N. L. Whitehouse¹, E. D. Robblee¹, R. S. Ordway¹, C. G. Schwab¹, P. S. Erickson¹, and D. E. Putnam², ¹University of New Hampshire, Durham, NH, ²Balchem Corporation, Slate Hill, NY.

Lysine (Lys) is generally the first or second limiting amino acid (AA) in metabolizable protein (MP) for lactating dairy cows (NRC, 2001). This

experiment was conducted to compare the dose-response relationships between duodenally infused LysHCl and dietary LysHCl as a way to estimate the "Lys bioavailability" value (ruminant escape x intestinal absorption) for dietary Lys. Two primiparous and 3 multiparous Holstein cows (63 to 126 DIM) were assigned to each of two squares in a balanced split-plot 5 x 5 Latin square design. Cows were fed a Lys-deficient basal diet supplemented with ruminally protected methionine (Met) to ensure that Lys was first limiting. Evaluation of the basal diet with NRC 2001 indicated 5.1% Lys and 2.4% Met in MP. Dosage levels were selected assuming Lys bioavailabilities of 100% for infused Lys and 20% for fed Lys. The five dosage levels (g Lys per 25.1 kg DM intake) for the infusion and fed squares were: (1) 0, 0; (2) 16.5, 82.5; (3) 33, 165; (4) 49.5, 247.5; and (5) 66, 330; respectively. The highest dosage for each square was selected to provide for 7.2% Lys in MP. Experimental periods were 14 d with the last 7 d for measurements of feed intake, production, and plasma AA. Content and yield of milk true protein and plasma Lys concentrations (% of total plasma AA) were considered to be the primary response criteria and are reported below. Infusing incremental Lys increased milk protein content and yield, and plasma Lys concentrations, whereas feeding incremental Lys was without effect. Feeding Lys did not result in sufficient responses from which to estimate a "Lys bioavailability" value for ruminally unprotected Lys. These data indicate that the "Lys bioavailability" for ruminally unprotected Lys is considerably less than 20%.

Item	Dose					Linear P=	Quad P=	Cubic P=
	1	2	3	4	5			
Milk protein %								
Infused	2.72	2.86	3.03	3.09	2.98	0.006	0.038	0.472
Fed	2.93	2.89	2.95	2.99	2.89	0.978	0.552	0.261
Milk protein, g/d								
Infused	1213	1258	1383	1430	1390	0.001	0.013	0.056
Fed	1292	1302	1275	1293	1320	0.502	0.346	0.515
Plasma Lys, % of TAA								
Infused	2.77	3.20	3.81	4.22	4.39	0.001	0.518	0.567
Fed	2.46	2.54	2.74	2.61	2.96	0.184	0.809	0.649

Key Words: Cows, Amino acids, Lysine

91 Timing of embryonic mortality and its relationship to serum progesterone in dairy cattle. M. J. Starbuck^{*}, R. A. Dailey, and E. K. Inskeep, West Virginia University, Morgantown, WV.

Embryonic mortality, a significant problem in the dairy industry, may be associated with many variables. Several potential factors were studied as predictors of pregnancy maintenance in pregnant dairy cows (N = 211) on two farms. Beginning on d 28 to 36 of gestation, cows were examined by ultrasonography for presence of a viable embryo. Pregnant cows were re-examined every 3 d until d 60 or between d 45 to 51 and d 59 to 66 for presence of an embryo and diameter of the CL and follicles ≥ 5 mm. Blood samples for progesterone were taken at each examination. Breed, age, parity, service number, sire, synchronization, inseminator, and milk production were recorded. Overall embryonic mortality was 11% (13% Farm 1 and 7% Farm 2). Late embryonic ($\leq d 45$ of gestation) and early fetal ($> d 45$ of gestation) losses accounted for 67% and 33%, respectively. Cows with two CL maintained fewer pregnancies ($p < 0.01$) than cows with one CL (73% vs. 91%). Two CL did not increase concentrations of progesterone. Because CL appeared functional (progesterone ≥ 1 ng/ml in the sample collected closest before embryo mortality), the embryo apparently died before CL regression. Embryonic loss, but not fetal loss was associated with concentrations of progesterone on d 28 to 37 ($p < 0.01$). Cows in higher body condition at d 28 to 36 maintained fewer pregnancies than cows in moderate or lower condition ($p < 0.05$). Older cows (≥ 5 yr) maintained fewer pregnancies than heifers ($p < 0.05$). Synchronization, inseminator, days postpartum, size of CL, size of largest follicle, number of large follicles, parity, and embryo size at 28 to 37 d or 45 to 51 d did not affect pregnancy retention. In conclusion, embryonic mortality after maternal recognition of pregnancy and during placentation, a significant problem in the dairy industry, is associated with luteal function during d 28 to 37.

Key Words: embryonic mortality, progesterone, dairy cattle

92 The effect of gastrointestinal parasitism on reproductive parameters in lactating dairy cows. J. Sanchez*¹, I. R. Dohoo¹, A. Nodtvedt², and L. DesCôteaux³, ¹Atlantic Veterinary College, University of Prince Edward Island, ²The Norwegian Zoonosis Centre, National Veterinary Institute, ³Faculté de médecine vétérinaire, Université de Montreal.

The effect of gastrointestinal parasitism in adult dairy cows was evaluated in a large clinical trial in two provinces of Canada. The impact of treatment on reproductive performance as measured by calving to conception interval, calving to first service interval and number of breedings was evaluated. Of the 28 dairy farms involved in the clinical trial, 20 of them kept computerized cow records on reproductive parameters. The lactating cows received either eprinomectin pour-on or placebo at calving. The effect of treatment on time to conception and time to first service were evaluated using cox proportional hazard models and a poisson model was used for the number of breedings to conception. A total of 610 cows were included in these analyses. No statistically significant effect for calving to conception interval (hazard ratio=1.16, P=0.20) or calving to first service interval (hazard ratio=1, P=0.53) was observed. There was, however, a 13% reduction in the number of breedings to conception for treated animals (count ratio=0.87, P<0.05). The ability of an indirect ELISA using a crude adult *Ostertagia ostertagi* antigen to discriminate animals that would benefit from treatment was evaluated using individual milk samples from a subset of 109 cows. The ELISA optical density (OD) values obtained between 120 days before calving and drying off were categorized as high OD (>=0.5) and low OD (< 0.5). Among untreated animals, the hazard of conception was lower (hazard ratio=0.38, 95% CI=[0.19,0.75]) for high OD cows compared to low OD cows suggesting that higher parasite burdens had an adverse effect on reproductive performance. Treated high OD cows had a hazard of conception equivalent to the hazard for all cows in the low OD group suggesting that treatment prevented the negative effect associated with these higher parasite burdens. Because of the small sample size in the current study, more works is needed to confirm both, the effect of eprinomectin treatment on reproduction and the ability of the ELISA to discriminate between groups of animals that would potentially benefit from anthelmintic treatment.

Key Words: Eprinomectin, *Ostertagia ostertagi* ELISA, reproduction performance

93 Management definition of alternative herd environments to investigate genotype by environment interaction. E Raffrenato*^{1,2}, R W Blake², P A Oltenacu², and J Carvalheira³, ¹Consorzio Ricerca Filiaria Lattiero-Casearia, Ragusa, Italy, ²Cornell University, Ithaca, NY, ³Universidade do Porto, Vairao, Portugal.

Genotype by environment interaction (GEI) reduces and makes unequal the net economic benefits in alternative herd environments. Our objective was to utilize management practices to define herd environment and to investigate the potential GEI. A 2000 survey of 168 Friesian and 74 Brown Swiss herds in southeastern Sicily provided 17 milk yield-enhancing practices that were used to build distance matrices for each breed based on the coefficient of Jaccard. Herds were clustered into high and low opportunity environments based on this information using the Lance-Williams flexible beta method. Genetic parameters were estimated by multiple trait derivative free REML analysis of first-lactation standardized yields of milk, fat and protein, and weighted somatic cell score (WSCS) from 8897 Friesian and 1143 Brown Swiss cows. High opportunity herds outperformed low ones for yield traits. Sire variances for yields were consistently smaller in the low opportunity environments, which is evidence for GEI. Estimated correlated responses indicated substantial opportunity losses in poor environments, including WSCS (0.66 for Friesian and 0.61 for Brown Swiss). Results suggested that these GEI arose from differential use of these management practices. This method of herd clustering was not data dependent, so assumptions are preserved when using standard statistical theory for estimation and testing.

Key Words: genotype environment, genetic parameters, milk yield

94 A comparison of chemical and microbial anti-fungal additives and their effects on the fermentation and aerobic stability of corn silage. D. H. Kleinschmit*, J. M. Neylon, T. L. Ebling, J. M. Ladd, J. E. Lynch, and L. Kung, Jr., University of Delaware, Newark.

Whole plant corn (27%) was ensiled in laboratory silos to investigate the effects of anti-fungal additives on fermentation and aerobic stability. Treatments were: 1) untreated (C), 2) inoculated with *Lactobacillus buchneri* (100,000 cfu/g of fresh forage, Pioneer Hi-Bred, Intl., Des Moines, IA), (PLB), 3) *L. buchneri* (400,000 cfu/g, Biotal, Inc., Eden Prairie, MN), (BLB), 4) Biomax 5 (*L. plantarum* PA-28 and K-270, 100,000 cfu/g, Chr. Hansen Biosystems, Milwaukee, WI), (B5), 5) sodium benzoate, 0.1%, (SB), 6) 50% potassium sorbate and 50% EDTA, 0.1%, (PSE), 7) buffered propionic acid, (0.1%, Kemin Industries, Des Moines, IA), (Ki 112), and 8) Siloguard II (0.05%, International Stock Food Corp., Marietta, GA), (SG). After 122 d of ensiling, numbers of yeasts were lowest in BLB. Aerobic stability was similar among BLB, SB and PSE and were greater (P < 0.05) than all of the other treatments. The concentration of acetic acid was greatest in BLB when compared to other treatments. Silages treated with SB and PSE had lower concentrations of ethanol than did other silages. Only the microbial inoculant, BLB, and the chemical additives, SB and PSE, were able to improve the aerobic stability of corn silage in this study.

Treatment	C	PLB	BLB	B5	SB	PSE	Ki 112	SG	SE
Yeasts, log cfu/g	4.42 ^a	3.70 ^a	0.90 ^b	4.82 ^b	3.47 ^a	2.96 ^{ab}	4.25 ^a	4.61 ^a	0.46
Aerobic stability, h	39.3 ^b	45.3 ^b	138.7 ^a	35.3 ^b	164.7 ^a	149.3 ^a	42.0 ^b	33.3 ^b	30.63
DM recovery, %	93.0 ^b	98.0 ^{ab}	96.1 ^{ab}	94.3 ^b	100.0 ^a	100.0 ^a	95.0 ^{ab}	95.9 ^{ab}	1.24
Acetic acid, %	2.19 ^{bc}	2.47 ^b	2.83 ^a	2.13 ^{cd}	1.86 ^d	2.02 ^{cd}	1.99 ^{cd}	2.08 ^{cd}	0.06
Ethanol, %	2.76 ^a	3.40 ^a	3.09 ^a	3.39 ^a	0.74 ^b	0.56 ^b	3.57 ^a	3.71 ^a	0.20

a,b,c,d Means in rows with unlike superscript differ (P < 0.05).

Key Words: Aerobic stability, Inoculants, Silage

95 Age-related response of somatotrophic axis in Hereford calves from birth to one year of age treated with bovine (b) somatotropin (ST). K.E. Govoni*, T.A. Hoagland, E.F. Jones, D. Schrieber, and S.A. Zinn, University of Connecticut, Storrs, CT, USA.

To determine the effects of bST administration on the somatotrophic axis from birth to one year of age in cattle, 10 male (M) and 10 female (F) Hereford calves were used. Within gender, 7 animals were injected with bST (500 mg; Posilac) and 3 were not injected (C). Blood samples were collected (3 samples every 30 min/d) for 7 d before (Pre) and 7 d after (Post) administration of bST on d 50, 100, 150 and 200. To determine response at birth, bST was administered immediately after the sample collection on d 0 (within 24 h of birth). BW were taken at each period. ST and Insulin-like Growth Factor-I (IGF) were analyzed by RIA. IGF Binding Protein (BP) -2 and -3 were quantified by Western Ligand Blot [expressed as arbitrary units (AU)]. Data were analyzed using the Proc Mixed model of SAS. BW were similar for M and F, however ADG was greater in M at 200 d (P < 0.05). In samples taken prior to bST administration, ST decreased from 0 to 200 d (P < 0.01; 34 to 15 ng/mL). However, ST decreased at 50 d in F but not until 150 d in M. In samples taken prior to bST administration, IGF increased over time in M (P < 0.05; 106 to 166 ng/mL), but not in F (P > 0.05; 105 to 116 ng/mL). From 0 to 200 d, BP-2 and -3 did not change and were not different between M and F. Administration of bST increased (P < 0.01) ST and IGF at each period measured from 0 to 200 d. Overall, in samples following bST administration, BP-3 increased (P < 0.05; 51 to 63 AU) while BP-2 decreased (P < 0.05; 51 to 44 AU) at each period from d 50 to 200. From birth to d 5, BP-3 decreased in C animals (P < 0.05; 70 to 33 AU), but no change was observed in bST treated animals

($P > 0.05$; 47 to 57 AU). At birth (d 0) BP-2 was less in bST treated calves than C ($P < 0.05$; 35 vs 61 AU), but BP-2 were similar on d 3 and 5 in bST treated and C animals. Thus, in terms of the somatotrophic axis, calves respond to bST administration, even at birth.

Key Words: Somatotrophic axis, Hereford calves, Bovine somatotropin

96 Differential effect of mammary inflammation on albumin and β -casein concentration in porcine milk. A. C. W. Kauf*, D. C. Pighetti, D. A. Pape, A. L. Magliaro, and R. S. Kensinger, *Penn State University, University Park.*

Mastitis in lactating sows reduces growth performance of the nursing litter (Curtis, 1974; Dyck et al., 1987). Mastitis in dairy cows reduces milk yield and changes milk composition (Carroll and Jain, 1969; Shuster et al., 1991), but less is known about the effects of mastitis on milk composition in the sow. Our objective was to quantify the changes in albumin and β -casein in sow milk in response to an intramammary endotoxin challenge (Kensinger et al., 1999). Nine parity-one Yorkshire sows received intramammary infusions of endotoxin (1.5 $\mu\text{g/gland/kg}$ BW) at 0700 on alternating days from d 2-10 of lactation. Endotoxin (ET) was infused into two functional, previously non-infused mammary glands on a total of three days. Milk samples were collected from both ET-treated and control mammary glands between 0900-1200 by manual expression during one or more nursing episodes. Albumin concentrations were determined by ELISA, and β -casein concentrations by Western blot analysis against a standard amount of β -casein. Data were analyzed by the Proc GLM option of SAS. Albumin concentrations in milk were elevated in ET-treated versus control glands (2.12 vs. 1.31 mg/ml, respectively; $P < 0.01$) on d 5-10 of lactation. β -casein concentrations in milk were decreased in ET-treated versus control glands (22.5 vs. 34.2 ng/mg total milk protein, respectively; $P < 0.01$) on d 5-10 of lactation. In addition, SDS-PAGE analysis of milk samples revealed a protein that co-migrated with a bovine lactoferrin standard. Concentrations of this band were greater in early (\leq d 4) versus mature milk (\geq d 5). However, there was little evidence for an effect of endotoxin challenge on the concentration of this putative lactoferrin in milk samples collected 2 to 5 hours post-intramammary infusion. This study shows that albumin increases and β -casein decreases in sow milk in response to intramammary infusion of endotoxin, and probably reflects host defense mechanisms in the sow.

Key Words: Porcine mastitis, Albumin, β -casein

97 Novel birth-weaning feeder reduces time spent learning to drink from an open vessel. R.W. Quinn*, T.G. Hartsock¹, N.C. Whitley², and L.W. Douglass¹, ¹*University of Maryland College Park*, ²*University of Maryland Eastern Shore.*

Teat seeking is an innate behavior of newborn pigs, allowing them to locate teats and begin suckling soon after birth. This behavior has proven to be problematic in the adaptation of neonatal pigs to artificial feeding systems. Piglets weaned into conventional group pens with milk replacer in troughs or modified poultry waterers continue to exhibit teat-seeking behaviors directed toward pen mates and objects within the pen and appear to discover the milk replacer "by accident." Consequently, many take longer than 12 hours to learn to drink unless assisted. A trough-style birth-weaning feeder was designed to take advantage of the

piglets' natural searching behavior in order to reduce the time to learn to drink from an open vessel. Immediately after birth, treatments were randomly assigned to 115 crossbred pigs from 15 litters as a two-by-two factorial. The pen treatments consisted of a novel trough-style Individual Pen feeder (IP, $n=60$) or a commercially available Group Pen feeder (GP, $n=55$). The second treatment designated piglets as Suckled ($n=58$) or Unsuckled ($n=57$) prior to weaning. Each piglet was observed for 6 hours following placement in a weaning pen. Data on time to first drink, general activity, nosing, sucking and aggressive nosing were recorded for each piglet. More IP piglets learned to drink than did GP piglets (82% vs. 16%, $p<.01$). However, in those pigs that did learn, average time to drink was not different between pens (GP 2.6h \pm .48h, IP 3.1h \pm .28h, $p=.21$). Prior suckling did not affect success in either pen ($p=.41$). GP piglets had higher levels of activity ($p<.01$) but there was a time x treatment interaction with GP activity being high and declining and IP activity remaining low and constant. GP piglets had higher incidences of nosing ($p<.01$), sucking ($p<.01$) and aggressive nosing ($p<.01$). Suckling did not affect activity levels, nosing or aggressive nosing ($p=.74$, .27 and .54, respectively). Unsuckled piglets had a higher incidence of sucking behavior that approached significance at $p=.053$.

Key Words: Piglet, Behavior, Weaning feeder

98 Development of a new in vitro model for infant colonic fermentation with immobilized cells. C. Cinquin*, G. Le Blay¹, I. Fliss^{1,2}, and C. Lacroix^{1,2}, ¹*Dairy research institut STELA, Quebec, Qc, Canada*, ²*Institut sur les Nutraceutiques et les Aliments Fonctionnels (INAF), Quebec, Qc, Canada.*

Different in vitro models have been used to study human colonic microbiota. However, for many of these models, and particularly chemostats, bacterial concentrations (109 CFU/ml) were much lower than those measured in faeces (1010-1011 CFU/ml), and culture stability was limited. In this work a new colonic fermentation system with immobilized-cells was developed for infant colonic microbiota. Fecal bacteria samples from infant were immobilized in 1-2 mm diameter gel beads (2.5% gellan gum, 0.25% xanthan gum, 0.2% sodium citrate) using a double phase dispersion process. Continuous cultures were carried out in a single-stage chemostat inoculated with immobilized cells, and fed with a medium specially designed to simulate baby diet. Different fermentation conditions (pH and residence times) were tested with the objective to simulate conditions in different sections of the infant colon (proximal, transversal and distal colon). The composition and metabolic activities of the microflora were monitored during a 54-day continuous culture. High survival rates for the major bacterial groups of the fecal flora were measured after immobilization. Bacterial concentrations and metabolic activities measured at steady state in the reactor effluent were influenced by culture conditions. The total population measured in colonized beads after one-week culture was high (>1010 CFU/g), and remained stable afterwards. Cell concentrations for the major bacterial groups in beads were very similar to those measured in fresh feces used for immobilization. Our study showed that cell immobilization could provide an environment more akin to the infant gastrointestinal tract, compared to conventional liquid cultures. This new in vitro model could be used to test the effects of different factors, including probiotics and prebiotics, on the colonic microbiota.

Key Words: Immobilized-cells, Colonic fermentation, Continuous-flow culture

Animal Behavior and Well-Being Influence of Environment on Animal Well-Being

99 Environmental enrichment for neonatal pigs and its influence on post weaning aggression. E.S. Jolly, J.B. Gaughan*, and A.K. King, *The University of Queensland, Gatton, Australia.*

Aggression is a common behavioural reaction seen amongst pigs that are weaned and subsequently mixed with other pigs. Post weaning aggression is harmful in that it can give rise to behavioural vices, lead to decreased productive output, may cause injuries and infection and possibly death. Decreasing the incidence of post weaning aggression and encouraging the incidences of play behaviour may be beneficial. This study investigated the effects of environmental enrichment for neona-

tal pigs and its influence on the incidence of post weaning aggression (tail and ear biting, bites and mouth hits directed towards the head and shoulder). The four treatments used were (i) No enrichment (control), (ii) Toys (either a rubber ball, small rubber tire, PVC pipe, empty plastic drink bottle or ice cream container), (iii) Handling (picking up, patting and stroking piglets as soon as possible after birth, and then for 10 minutes/litter 4 times each week), (iv) Toy plus handling. Forty sows plus litters were used (10 per treatment). Toys were placed with the sow and litter from 5 d of age and rotated every three d. Following weaning (24 d of age) the pigs were allocated to weaner pens based on treatment and blocked for sex. Video surveillance was used to record piglet interactions throughout lactation and for the first 24 h post weaning. The pigs'