was left under these conditions for 5 min before the start of data collection. The spectrum was collected in the region between 4000 and 650 cm^{-1} at a resolution of 4 cm^{-1}, and a rate of 256 scans per sample. The crystal was cleaned between samples using distilled water, propanol, and distilled water, and then wiped to complete dryness. The spectrum obtained after subtraction of water spectrum from the sample spectrum was used to analyze for lactose and lactic acid. Cheeses spiked with lactose and lactic acid showed a shift in spectrum in the regions of 1200 to 1050 and 1700 to 1500 cm^{-1} respectively. In the next phase of the study, three replicates of cheeses with two different levels of residual lactose and calcium were manufactured. The levels of lactose and lactic acid were measured by HPLC and the FTIR spectra were collected for the cheese curds prior to salting, and cheese at day 1, 3, 5, 7, and 9 during ripening. The level of residual lactose and calcium in the cheese at day 1 was significantly ($p \leq .05$) different for the two treatments (.73 and 1.93% for lactose; .85 and .66% for calcium), and the level of lactose decreased in both treatments during the first 9 days of ripening. Subsequently partial least squares and principal component analysis will be used to characterize changes in lactose fermentation to the shifts in the FTIR spectrum during initial cheese ripening.

37 Evaluation of salt whey as an ingredient in process cheese. R. Kapoor* and L. E. Metzger, *MN-SD Dairy Food Research Center, University of Minnesota, St. Paul, MN.*

Salt whey refers to the whey stream obtained during the salting and mellowing step of a cheese manufacturing process. Due to its high salinity level, it is underutilized and also leads to disposal costs. Consequently, alternative uses need to be pursued. The major components of salt whey (salt and water) are used as ingredients in process cheese. The objective of this research was to determine if salt whey, obtained from a traditional Cheddar cheese manufacture process, could be used as an ingredient in process cheese. Three replicates of Process Cheese (PC), Process Cheese Food (PCF) and Process Cheese Spread (PCS) with two treatments each were manufactured. Treatment 1 (C) used the control formula and treatment 2 (T) involved the modified formula using salt whey to replace salt and water. Salt whey was collected during the salting and pressing steps of the Cheddar cheese procedure at the University of Minnesota, followed by mixing and pasteurization. There were no significant differences ($p \geq .05$) in process cheese composition between the treatments. Texture Profile Analysis (TPA) and Rapid Visco Analyzer (RVA)-melt analyses were performed on all the process cheeses. Schrieber melt test was performed on PC and PCF and the tube melt test on PCS. The mean TPA-hardness values obtained respectively for the C and T were 126 N and 115 N for PC, 61 N and 59 N for PCF, and 12 N and 12 N for PCS. The mean melt diameter obtained for C and T process cheeses were 48.5 mm and 49.4 mm for PC, and 61.6 mm and 63 mm for PCF. The tube-melt for PCS (C and T) was 75.1 mm and 79.8 mm respectively. There were no significant differences ($p \geq .05$) in the TPA-hardness and the RVA hot viscosity for PC, PCF and PCS between the treatments. The Schreiber melt of C and T for PC and PCF and the tube melt values for C and T in PCS also showed no significant differences ($p \geq .05$). The replacement of salt and water with salt whey in PC, PCF and PCS had no significant effect on their functionality.

Key Words: Process cheese, Salt whey

38 Strategies to improve stability and performance of calibration samples for infrared milk analyzers. K. E. Kaylegian* and D. M. Barbano, *Northeast Dairy Foods Research Center, Cornell University.*

Infrared milk analyzers are traditionally calibrated using sets of 10 to 12 raw milk samples from individual farms. Although taken from the local milk population, these sets of samples are limited by a short shelf-life, a short and variable range in component concentration, nonuniform distribution of concentrations within the range, and correlation in concentration changes among components. An alternate approach using ultrafiltration (UF) to produce calibration samples provides a means to overcome these weaknesses and improve calibration performance. UF calibration samples were produced by gravity separating pasteurized milk, centrifugally separating the gravity skim to remove residual fat, and ultrafiltering the skim milk. The gravity cream (ca. 25% fat), UF retentate (2X), UF permeate, lactose α-monohydrate, and water were combined to make calibration sets designed to have a large range and incremental changes in each component and to uncouple the fat and protein correlation. The 12 sample UF calibration set had a range of 2.0-6.0% fat, 2.0-4.3% true protein, and 4.0-5.3% anhydrous lactose. Shelf life of preserved UF calibration samples was 4 wk compared to 2 wk for individual farm samples. Comparison of performance of individual farm and UF calibration sets was by standard deviation of the difference (SDD) between chemistry and infrared prediction, the stability of the instrument slope and bias with time, set to set variation in these values, and the frequency of high leverage samples within calibration sets. UF calibration sets had smaller SDD within sets and were more consistent among sets, indicating better calibration performance with respect to agreement with chemistry. The UF calibration samples exhibited a more stable slope and bias for each component and fewer high leverage samples than for farm milk calibration samples, both within calibration sets and among sets over several months of operation.

Key Words: Infrared milk analysis, Calibration, Ultrafiltration

39 WITHDRAWN , .

ADSA/ASAS Northeast Graduate Student Paper Competition

40 Effects of *trans*-8, *cis*-10 CLA and *cis*-11, *trans*-13 CLA on milk fat synthesis. J. W. Perfield II*[1], A. Sæbo[2], and D. E. Bauman[1], [1]*Cornell University, Ithaca, NY,* [2]*Natural ASA, Hovdebygda, Norway.*

Conjugated linoleic acid (CLA) supplements that cause a reduction in milk fat secretion in dairy cows have typically been comprised of 4 isomers (*trans*-8, *cis*-10; *cis*-9, *trans*-11; *trans*-10, *cis*-12; *cis*-11, *trans*-13 CLA). Abomasal infusion of pure isomers has shown that *trans*-10, *cis*-12 CLA is a potent inhibitor of milk fat synthesis, whereas *cis*-9, *trans*-11 CLA has no effect (Baumgard et al. 2000, Am. J. Physiol. 278:R179-84). However, there appear to be additional fatty acid intermediates that inhibit milk fat synthesis based on infusion of various CLA enrichments (Chouinard et al. 1999, J. Dairy Sci. 82:2737-45) and studies with rumen-protected CLA (Perfield et al. 2002, J. Dairy Sci. 85:2609-17). The objective of this study was to investigate the effects on milk fat synthesis of additional CLA isomers present in the rumen-protected supplements. Four rumen fistulated Holstein cows (141 $\pm$ 8 DIM, mean $\pm$ SE) were randomly assigned in a 4 X 4 Latin square experiment. Treatments were abomasal infusion of 1) skim milk (negative control), 2) *trans*-10, *cis*-12 CLA supplement (positive control), 3) *trans*-8, *cis*-10 CLA supplement, and 4) *cis*-11, *trans*-13 CLA supplement. Treatments 2 to 4 were targeted to provide 4 g/d of the CLA isomer of interest and the daily dose provided by infusion at 6 h intervals. Treatment periods were 5 d in length with 7 d washout periods. The *trans*-8, *cis*-10 CLA had no effect on milk fat yield whereas *trans*-10, *cis*-12 CLA reduced milk fat yield by 35% ($P < 0.01$). The *cis*-11, *trans*-13 CLA supplement contained some *trans*-10, *cis*-12 CLA and when data were corrected to account for this, it was obvious that *cis*-11, *trans*-13 CLA also had no effect on milk fat synthesis. Milk fat content (g/100 g fatty acids) of specific CLA isomers was significantly elevated within respective treatment groups (*trans*-8, *cis*-10 CLA (0.27); *trans*-10, *cis*-12 CLA (0.18); *cis*-11, *trans*-13 CLA (0.23); $P < 0.001$). Milk yield ($P < 0.37$), DMI ($P < 0.44$) and milk protein yield ($P < 0.22$) were unaffected by treatment. Overall, abomasal infusion of *trans*-10, *cis*-12 CLA reduced milk fat synthesis, while the other major isomers present in rumen-protected CLA supplements (*trans*-8, *cis*-10 CLA and *cis*-11, *trans*-13 CLA) had no effect.

Key Words: CLA, Milk fat depression, Dairy cow

41 Effect of prepartum dietary carbohydrate source and monensin on dry matter intake, milk production and blood metabolites of transition dairy cows. M. M. Pickett*, T. W. Cassidy, P. R. Tozer, and G. A. Varga, *The Pennsylvania State University, University Park, PA.*

Ninety-four multiparous Holstein cows (3.39 $\pm$ 0.05 BCS) were used in an complete randomized block design to evaluate the effects of carbohydrate source and monensin on dry matter intake, milk production and blood metabolites of transition cows. Two diets with (+) or without (-)

supplemental monensin (0 or 330 mg/d) were evaluated in a 2 X 2 factorial arrangements. The prepartum CONV diet contained 70% forage and the NFFS diet contained nonforage fiber sources such that 28% of the forage was replaced with cottonseed hulls and soyhulls. Treatments were designated CONV-, CONV+, NFFS-, and NFFS+. The prepartum diets were formulated to contain 1.55 Mcal/kg NE_L, 40% NDF, and 14% CP. Dietary treatments began at dry off and continued until parturition. Monensin was top dressed daily starting 28 d prior to expected calving date. Prepartum dry matter intake (DMI) was significantly higher for cows fed the NFFS diet compared to cows fed the CONV diet (P $\leq$0.05; 12.5, 11.2, 15.5, 15.1 $\pm$ .5 kg/d). There were no differences in postpartum DMI (21.2 $\pm$ .7 kg/d) or milk yield (43.1 $\pm$ 2.1 kg/d). Body condition score did not differ prepartum (3.38 $\pm$ .05) or postpartum (2.94 $\pm$ 0.05). CONV treatment had higher plasma nonesterified fatty acids (NEFA) prepartum than NFFS treatment (P $\leq$0.05; 236.2, 199.4 $\pm$11.7 μE/L). At d 3 and 5 prepartum NFFS diet had lower plasma NEFA concentrations than the CONV diet (P $\leq$0.05; 171.1 vs. 264.2 $\pm$ 25.1; 255.6 vs. 385.5 $\pm$ 23.3 μE/L). Postpartum NEFA were not affected by treatment (411.6 $\pm$ 22.4 μE/L). Monensin supplementation prepartum did not affect postpartum DMI, milk production or plasma NEFA concentrations. The inclusion of nonforage fiber sources in the prepartum diet increased prepartum DMI and decreased NEFA prepartum but had no affect on postpartum DMI or milk production.

Key Words: Nonforage fiber, Monensin, Transition cow

42 Photoperiod Manipulation affects milk yield and mammary growth in pubertal heifers induced to lactate.

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Cows exposed to a short day photoperiod during the dry period produce more milk, but the mechanisms behind this effect are unclear. We hypothesized that exposure to short days during hormonal induction of lactation would stimulate milk production and mammary growth. To test this hypothesis, Holstein heifers (n=12; 14 mo old) were assigned to either long day photoperiod (LDPP; 16h light:8 h dark), or short day photoperiod (SDPP; 8h light:16h dark) treatment and were fed melengesterol acetate (MGA) for 14 d to synchronize estrous. Heifers were then treated with estrogen and progesterone (E+P; .1 and .25 mg/kg/d) for 7d to induce lactation. Twenty-one days after the initial E+P injection, twice-daily milking was initiated, all heifers were placed on LDPP, and biweekly treatment with rBST (Posilac®) commenced. Mammary tissue was obtained by biopsy at 0, 5, and 10 d relative to initial E+P injections and explants were used to quantify rates of [^{3}H]-thymidine incorporation into DNA *in vitro*. Milk yield and composition were also measured. Milk yield was low initially in both groups but began to diverge after 19 DIM and averaged 16.3 $\pm$ 1.2 vs 12.6 $\pm$ 1.3 kg/d (P=.05) at 63 DIM for SDPP and LDPP, respectively. Milk composition and SCC did not differ between treatments (P>.10). Averages across groups for milk protein (3.17 $\pm$ .04%), milk fat (4.44 $\pm$ .14%), and SCC (3.27 $\pm$ .44%) indicated that milk composition was relatively normal. Incorporation of [^{3}H]-thymidine *in vitro* did not differ between treatment groups (P>.10). In both groups, cell proliferation increased over time (P<0.01), averaging 199 $\pm$ 54, 726 $\pm$ 71, and 558 $\pm$ 68 dpm/ug DNA on days 0, 5, and 10, respectively. We conclude that SDPP treatment during induced lactation in pubertal dairy heifers resulted in higher milk yields but did not affect cell proliferation at the times sampled.

Key Words: Photoperiod, Induced lactation, Mammary growth

43 Abnormal udder conformation in pubertal heifers induced into lactation.

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Hormonal induction of lactation in pubertal heifers could provide a potential means to enhance economic efficiency, but effects on mammary development and conformation have not been reported. Twelve, 14 mo old Holstein heifers were assigned to either long day (LD; 16h light:8 h dark), or short day (SD; 8h light:16h dark) photoperiod treatment and were fed melengesterol acetate (MGA) for 14 d to synchronize estrous. Heifers then received daily injections of estrogen (E; 0.1mg/kg/day) and progesterone (P; 0.25mg/kg/day) for 7 d to induce lactation. Twenty-one days after the initial E+P injection, twice-daily milking was initiated, all heifers were placed on LD, and biweekly treatment with rbST (Posilac® commenced. Varying degrees of abnormal udder conformation were observed. In general, heifers exhibited highly sloped udder floors with long teats pointing forward. Apparent differences in capacity of individual quarters were quantified by quarter milking at 60, 180 and 300 DIM. Quarter milking yields did not differ between treatments (P>.10) but confirmed apparent size differences per quarter (P<.09). Among quarters, the left rear produced more milk than the left front (P= .01) with the other quarters not significantly different. To assess conformation, udders were scored using the linear scoring system at 300 DIM. Total linear udder scores did not differ by treatment and, except for three heifers, were below breed average. To further assess conformation, quartering was assessed on a scale of 1-45, where 1=no demarcation between quarters, 25=desirable conformation, and 45=extreme quartering. Quartering score averaged 37 $\pm$2.1 and was not different between treatments (P>.10). We conclude that induction of lactation resulted in abnormal udder conformation. This effect could be related to the short length of hormone treatment compared to a natural pregnancy. Heifers will be monitored in their subsequent parturient lactation to determine whether abnormalities are corrected.

Key Words: Pubertal heifers, Udder conformation, Induced lactation

44 A comparison of the effects of microbial inoculants designed to improve the aerobic stability of corn silage.

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Whole plant corn was harvested at 1/2 milk line (32% DM) and ensiled in 20-L laboratory silos for 108 d to measure the effects of microbial inoculants on fermentation and aerobic stability. Fresh forage was assigned to one of the following treatments: 1) Untreated (U), 2) *Lactobacillus buchneri*11A44 (Pioneer Hi-Bred Intl., Des Moines, IA, 100,000 cfu/g of fresh forage weight) (PLB1), 3) *L. buchneri* 11A44 (400,000 cfu/g) (PLB4), 4) *L. buchneri* 40788 (Lallemand Animal Nutrition, Milwaukee, WI, 400,000 cfu/g) (LLB), and 5) Biomax 5 (L. plantarum PA-28 and K-270, 100,000 cfu/g, Chr. Hansen Biosystems, Milwaukee, WI), (B5). After ensiling, the pH of all silages were similar to U except for PLB4, which was greater ($P < 0.05$). The concentration of lactic acid in B5 (5.88%) was greatest of all treatments, whereas PLB1, PLB4, and LLB (4.75, 3.72, and 4.40%, respectively) had a lower concentration of this acid than U (5.27%). The concentration of acetic acid was greatest in PLB4 (7.59%), whereas PLB1 and LLB (6.31 and 6.29%, respectively) had greater levels of this acid than U and B5 (3.29 and 2.92%, respectively). Yeasts were undetected in all silages except B5 (4.95 $\log_{10}$ cfu/g). Aerobic stability was determined by exposing silage to air and recording the number of h before silage temperature increased 2C above ambient room temperature. The aerobic stability of B5 (52 h) was worse compared to U (73 h), whereas, PLB1, PLB4, and LLB remained stable after > 210 h. In conclusion, the aerobic stability of silage treated with PLB1, PLB4, and LLB may be attributed to the absence of yeasts and high levels of acetic acid present in these silages.

Key Words: Silage, Inoculants, Aerobic stability