

Production, Management and the Environment: Dairy

T302 Effects of increased milking frequency on productivity of Holstein dairy cows. M. Dehghan-Banadaky*, M. Eslamizad, K. Rezayazdi, M. Moradi-Shahrbabak, and H. Bahrami, *Department of Animal Science, Campus of Agriculture and Natural Resources, University of Tehran, Karaj, Tehran, Iran.*

An experiment was conducted to determine the effects of different milking frequencies on the performance of Holstein cows. 105 multiparous and 15 primiparous Holsteins cows were assigned based on parity at calving to 1 of 3 treatments as follows: 1) milking 6 times per day in whole period (6x); 2) milking 6 times per day for 90 d and switching to 3 times subsequently (6x-3x); and 3) 3 times milking per day in whole period (3x). Milk production recorded every day for the first 60 DIM and on 2 consecutive days a week afterward. Cows were weighed after parturition and then weighed and scored for their body condition monthly; milk samples were taken monthly. Data until 150 DIM were statistically analyzed using the repeated measures option in Proc Mixed of SAS with cow as a random effect. Overall milk and fat corrected milk (FCM 3.5%) yield were higher on 6x and 6x-3x cows than 3x cows (41.03, 42.3; 40.11, 40.60 VS 37.97, 38.40 kg/d, respectively). Milk component concentration was not affected by treatment except solids non fat (SNF) that increased in 6x and 6x-3x group ($P < 0.05$). DMI was not different between treatment groups (23.04 and 23.12 vs. 22.45 kg/d for 6x, 6x-3x, and 3x cows respectively). 3x cows began to gain weight sooner than did 6x and 6x-3x cows but there were no significant differences between treatments for body weight change at the end of 150 DIM. These results indicate that increasing milking frequency to 6x, increased milk yield during early lactation, but did not have carryover effect after switching to 3x in 90 DIM. Relative to production and economical aspects, 6x until 90 DIM and then switching to 3x subsequently was preferred to other treatments.

Key Words: milking frequency, milk production, Holstein cows

T303 Effects of increasing milking frequency on blood metabolites of Holstein cows. M. Eslamizad, K. Rezayazdi, M. Dehghan-Banadaky*, H. Kohram, and R. Heydari, *Department of Animal Science, Campus of Agriculture and Natural Resources, University of Tehran, Karaj, Tehran, Iran.*

One hundred five multiparous and 15 primiparous Holsteins cows were assigned based on parity into 3 treatment groups immediately after calving. Treatments were: 1) milking 6 times per day in whole period (6x); 2) milking 6 times per day for 90 d and switching to 3 times subsequently (6x-3x); and 3) 3 times milking per day in the entire period (3x). Blood samples were taken from each cow at 15, 30, 60, 90, 120, 150 DIM, 3 h after morning meal for metabolic profiling. Data until 150 DIM were statistically analyzed using the repeated measures option in Proc Mixed of SAS with cow as a random effect. Blood glucose concentration was higher but blood nonesterified fatty acids (NEFA) and β -hydroxybutyric acid (BHBA) concentration were lower in 3x than 6x and 6x-3x cows ($P < 0.05$). Most of the differences were observed 30 initial days of the experimental period, indicating more severe negative energy balance in 6x and 6x-3x than 3x cows in fresh period. Phosphorous, blood urea nitrogen (BUN), triglycerides (TG), total protein, aspartate aminotransferase (AST) concentration were unaffected by treatments (Table 1). Overall, results suggest that metabolic health may be suppressed by increasing milking frequency in fresh cows. In respect to metabolic health aspects, 3x was preferred to other treatments.

Table 1. Metabolic profiles of cows had different milking frequency

Metabolites	Treatments			SEM	P-value
	6x	6x-3x	3x		
Glucose (mg/dL)	64.36 a	63.44 a	69.02 b	1.910	0.02
NEFA (mmol/L)	0.44 a	0.38 ab	0.33 b	0.044	0.015
BHBA (mmol/L)	0.94 a	0.91 a	0.69 b	0.095	0.006
AST(unite/L)	71.14	63.07	64.61	3.830	0.14
TG (mg/dL)	12.46	12.45	13.77	1.831	0.48
Total protein (g/dL)	8.98	9.19	8.83	0.270	0.23
Phosphorous (mg/dL)	6.88	6.66	6.74	0.201	0.60
BUN (mg/dL)	21.27	21.84	21.13	1.150	0.64

a,b LSM within a row not sharing a common superscript differ ($P < 0.05$).

Key Words: milking frequency, Holstein cows, blood metabolites

T304 Effect of temperature-humidity index on test day milk yield of Iranian primiparous Holsteins. H. Farhangfar*¹, A. Arab¹, S. R. Mirae Ashtiani², A. Riasi³, H. Rashid⁴, and M. K. Akbari⁴, ¹*Birjand University, Birjand, Iran*, ²*Karaj University of Agriculture and Natural Resources, Karaj, Iran*, ³*Esfahan Industrial University, Esfahan, Iran*, ⁴*Agricultural Jihad Organisation, Mashhad, Iran.*

This research aimed to investigate the potential effect of temperature-humidity index (THI) on test day milk yield of Iranian Holsteins. The data were 95,510 moly test day milk records collected from 11,054 first parity Holstein cows calved from 1994 to 2008 in 76 herds of Mashhad, Iran. Milk records were augmented with climate information gathered by local climate stations. The climatic information was daily temperature (maximum, minimum and average) and relative humidity percentage over 2 decades data recording. THI was calculated based upon the formula which was pointed out by Aguilar et al. (J. Dairy Sci. 2009, 92:5702–5711). Response variable was monthly test day milk records for which there was an average 26.92 Kg (SD = 6.91 Kg) in the whole data set. A statistical linear model was used to evaluate the effects of some environmental factors. In the test day model, fixed effects of herd, year and month of milk recording, milking times, along with covariables of Holstein genes (linear), age at test day recording (linear and quadratic), days in milk (linear and quadratic) and THI (linear) were included. The model was fit with Mixed Procedure of SAS program. The results indicated that all environmental independent (categorical and continuous) variables included in the model had statistically significant ($P < 0.01$) influence on test day milk yield. The estimate of partial linear regression coefficient of test day milk yield on THI was found to be 7 gr THI-1 indicating that in average daily milk production increases as THI increases one unit until reaching the turning point in which it decreases due to heat stress. It can be therefore concluded that THI is needed to be taken into account in genetic evaluation of dairy cows as an animal model is applied to predict breeding value of the population under consideration.

Key Words: Iranian Holstein, temperature-humidity index, test day milk yield

T305 Application of mixed linear model to evaluate effects of temperature and relative humidity on lactation milk yield of Iranian primiparous Holsteins. H. Farhangfar*¹, H. Roshan¹, N. Emam Jomeh Kashan², and M. H. Fathi Nasri¹, ¹*Birjand University, Birjand, Iran*, ²*Aboureyhan University, Tehran, Iran.*

The main aim of this research was to evaluate the effects of temperature and relative humidity on lactation milk yield of Iranian first parity Holstein cows. The data set comprised of 5,323 lactation milk records obtained from 5,323 primiparous Holsteins calved between 1994 and 2007 in 64 herds of Mashhad city, Iran. Total number of sires was 660. In the whole data set, averages of lactation milk yield and age at first calving were 7823 kg and 26.35 Months, respectively. Total lactation milk yield of individual cows was predicted based upon using Gompertz nonlinear function as applied by Fathi Nasri et al. (Journal of Agricultural Science 2008, 146:633–641). A mixed linear model was applied in which fixed effects of herd, year and month of calving, linear covariables of Holstein gene percentage, open days, days in milk, age at first calving (in month), temperature (in Centigrade) and relative humidity (%), and random effect of sire were included. Daily temperature and relative humidity information (obtained from local weather stations) were averaged over the course of the lactation for individual cows. The model was run using Mixed Procedure of SAS software. Results showed that herd, year and month of calving, Holstein gene percentage, age at first calving, days in milk and average temperature had significant ($P < 0.01$) effects on lactation milk yield. Open days and relative humidity were found to be non-significant factors for lactation milk yield. For all the covariables with significant effect, positive partial regression coefficients were detected. The results indicated that total lactation milk yield increased by 36.65 kg as the average temperature increased by one centigrade. The findings of this research suggest that temperature information could be taken into account for analyzing milk records when a test day model is used.

Key Words: Iranian Holstein, temperature, Gompertz nonlinear function

T306 The association between days in milk, somatic cell counts, milk urea nitrogen, and percentage of milk fat and protein in dairy cows. S. R. Heidari Khormizi*, M. Dehghan Banadaki, and F. Farhang, *University of Tehran, Tehran, Karaj, Iran.*

Data concerning to days in milk, SCC, milk urea nitrogen, percentage of milk fat and protein from 5 commercial dairy herds in Iran were collected monthly from 2004 to 2007 to study relationship between them. Days in milk were grouped into 30-d increments with those greater than 420 d grouped into one category. Milk urea nitrogen was grouped by increments of 2 mg/dL with those less than or equal to 6 mg/dL grouped into one category, and equal to or greater than 26 mg/dL as a category. Univariate linear regression models were developed using Proc Mixed in SAS to test the relationship between days in milk (dependent variable) and other variables. The results of this study showed that DIM significantly affected SCC, milk urea nitrogen and percentage of milk fat and protein. In cows, SCC was at its minimum amount between 60 and 90 d after calving and reached maximum between 90 and 120 d of lactation. Significant differences in MUN were observed between herds ($P < 0.0001$), with a significant variability between test dates within herds. Significant effect of parity ($P < 0.0001$) and its interaction with DIM were also found. MUN increased at the beginning of the lactation, reached a maximum between 150 and 180 d postpartum, and then steadily decreased until the end of lactation. Percentage of milk fat and protein increased at >240 d postpartum. The results of this study suggest that days in milk is an important part in demonstrating milk composition changes.

Key Words: days in milk, somatic cell counts, milk urea nitrogen

T307 The association between milk urea nitrogen, milk yield, Somatic Cell Counts and parity in Holstein dairy herds. S. R. Heidari Khormizi*, M. Dehghan Banadaki, S. Hasanlou, and F. Fatehi, *University of Tehran, Karaj, Tehran, Iran.*

This study was conducted using data from Dairy Herd Improvement monthly tests to investigate the association between milk urea nitrogen concentration (MUN), milk yield, somatic cell counts, milk fat percentage, milk protein percentage, and order of lactation in 5 commercial dairy herds from Iran. Mean MUN for Holstein cows was 19.78 mg/dl. Mean MUN, categorized by 30-d increments of days in milk (DIM), paralleled changes in milk values and followed a curvilinear shape. Multivariate mixed linear regression (Proc Mixed in SAS) was used to determine the relationship between MUN (dependent variable) and independent variables: milk yield, somatic cell counts, milk fat percentage, milk protein percentage, and order of lactation. The results showed that the highest milk yield (32.65 ± 0.09 kg/d) was associated to higher milk urea nitrogen compare with cows with the lowest daily milk yield. The highest somatic cell counts (970.56×10^3 cell/ml) was associated to lower milk urea nitrogen compare with cows with the lowest milk urea nitrogen. As the milk protein percentage increased, MUN concentration decreased; Milk fat percentage also decreased so that the higher percentage of milk fat and protein (3.69 ± 0.01 and 3.31 ± 0.003 respectively) were found for cows with lower milk urea nitrogen. For cows, concentration of milk urea nitrogen was different among lactation groups 1, 2, and 3+. Milk urea nitrogen increased as parity decreased. It was concluded that milk urea nitrogen should be evaluated in association with milk yield, somatic cell counts, milk fat, milk protein, and parity.

Key Words: milk urea nitrogen, milk yield, dairy herds

T308 Control of acute postpartum metritis in lactating dairy cows at high risk of developing metritis following dystocia, stillbirth, twinning and/or retained placenta/fetal membranes with ceftiofur crystalline free acid sterile suspension (CCFA-SS). C. McLaughlin*, C. LaGrow, C. Daugherty, E. Stanisiewski, and M. Lucas, *Pfizer Animal Health, Kalamazoo, MI.*

Metritis is associated with significant economic loss due to treatment costs, reduced reproductive performance and premature culling. The objective of this multi-location clinical trial was to demonstrate that administration of 6.6 mg/kg BW dose of CCFA-SS once subcutaneously at the base of the ear reduces incidence of acute postpartum metritis compared with control cows. The study was a randomized block design with cows blocked on order-of-entry within herds without regard to parity to either saline treated (CON) or CCFA-SS. Daily observations were performed on d 1 to 14, rectal temperatures were recorded on d 0 to 14 and physical examinations were conducted on d 0–2, 7 \pm 1, and 14. Twelve study sites, in CA (4), NY (2), IA (1), MI (2), FL (2) and TX (1) each enrolled at least 40 animals. Of the 494 animals enrolled (247 CON and 247 CCFA-SS), 54 were ineligible for analysis and 17 were removed from the study before d 14 for reasons unrelated to acute postpartum metritis. Cow was the experimental unit and the primary decision variable was incidence rate of metritis, defined during the d 14 physical exam as rectal temperature $\geq 39.5^\circ\text{C}$ and a vaginal discharge score of 3 (not fetid; thin watery, serous; red, brown vaginal discharge), or a vaginal discharge score of 4 (fetid vaginal discharge), regardless of rectal temperature. Generalized linear mixed models were used. Incidence rate of metritis was lower for cows that received CCFA-SS than for CON (31.6 vs. 48.0%, $P = 0.0182$) with a difference of 16.4%. Mean rectal temperature over the first 6 d of study was lower ($P = 0.0015$) for CCFA-SS compared with CON cows. No detrimental effects attributable to the administration of CCFA-SS were observed. It

was concluded that CCFA-SS is safe and effective for control of acute postpartum metritis in lactating dairy cattle at high risk of developing metritis following dystocia, stillbirth, twinning and/or retained placenta/fetal membranes.

Key Words: metritis, dairy cow, ceftiofur

T309 Evaluation of ceftiofur crystalline free acid sterile suspension (CCFA-SS) administered to dairy cows exhibiting risk factors for acute postpartum metritis. E. Stanisiewski, C. Daugherty*, J. Hallberg, and M. Lucas, *Pfizer Animal Health, Kalamazoo, MI.*

The objective was to evaluate incidence of acute postpartum metritis in dairy cows after abnormal calving when given a single dose of CCFA-SS within 24 h following calving (day 0) at 6 commercial dairies. CCFA-SS was administered subcutaneously in the base of the ear. Response was compared with untreated controls (CON) that also exhibited abnormal calving. Abnormal calving was defined as dystocia, twins, retained membranes (≥ 12 h), stillbirth or any combination thereof. The study was a randomized block design with cows blocked on order of entry within herds without regard to parity to 1 of 2 treatments; CON or CCFA-SS (6.6 mg ceftiofur equivalents/kg). Untreated controls with normal calving (NTX) were included for observational purposes. Cow (122 NTX, 122 CON and 121 CCFA-SS) was the experimental unit. A generalized linear mixed model was used. Daily observations, including rectal temperatures, were performed on days 1 to 21 \pm 2 along with physical examinations on Day 0–2, 7 \pm 2, 14 \pm 2 and 21 \pm 2. A random subpopulation (about 50% of abnormal calving/at-risk cows) had samples collected from the uterus by swab on days 3 or 4, 7 \pm 2, 14 \pm 2 and 21 \pm 2 for evaluation of bacteria present. The primary decision variable was incidence rate of metritis, defined as rectal temperature $\geq 39.5^\circ\text{C}$ and fetid vaginal discharge. Cows with associated abnormal calving events that received CCFA-SS had lower ($P \leq 0.038$) incidence rates of metritis than CON at all 3 time points on study, with differences of 13.7 (day 7 \pm 2), 16.8 (day 14 \pm 2) and 14.9% (day 21 \pm 2). Mean rectal temperature was lower ($P = 0.032$) in cattle over the first 6 d of study that received CCFA-SS compared with CON. Within day contrasts showed temperatures were 0.16 to 0.28 $^\circ\text{C}$ lower ($P < 0.05$) in CCFA-SS cattle on study days 1, 2 and 3 compared with CON. Uterine cultures found *Escherichia coli* in 80% of samples during the first week postpartum. Incidence of acute postpartum metritis was reduced in dairy cows after abnormal calving when given a single dose of CCFA-SS within 24 h following calving.

Key Words: metritis, dairy cow, ceftiofur

T310 Evaluating reproductive outcomes in United States Holstein dairies. L. M. Moeller*¹, N. A. Michael¹, J. C. Dalton², and G. C. Lamb³, ¹*ABS Global, Inc., DeForest, WI*, ²*University of Idaho, Caldwell*, ³*University of Florida, Marianna.*

To assess reproductive management data were analyzed from 85 Holstein dairies in 4 regions of the US. Records of 231,288 cows and 649,495 matings from Region 1 (CA, ID, WA; n = 22 herds), Region 2 (KS, NM, TX; n = 15 herds), Region 3 (IL, MN, SD, WI; n = 35 herds), and Region 4 (IN, MI, NC, NY, OH, PA; n = 13 herds) were evaluated between August 2008 and August 2009. Analyses were conducted with PROC GLM to determine reproductive responses using herd as the experimental unit. Herd size ranged from 258 to 15,866 cows among all herds. Mean herd size was greater ($P < 0.01$) for Region 1 (5,809 \pm 522) than Regions 2 (2,569 \pm 632), 3 (1,240 \pm 414) and 4 (1,704 \pm 678). For all inseminations, the overall percentage of cows inseminated after estrus or ovulation synchronization with a fixed-time AI (TAI)

protocol was 43.4%, and was greater ($P < 0.01$) for Region 3 (63%) than Regions 4 (46%), 1 (24%), and 2 (18%). The overall percentage of cows receiving an insemination after an observed estrus was 56.4%, and was greater for Region 1 (76%) than Regions 2 (82%), 4 (54%), and 3 (37%). Overall conception rates to first service TAI was 30.5% and was greater ($P < 0.01$) for Region 3 (33.6%) than Regions 1 (28.6%) and 2 (23.9%), whereas Region 4 (30.8%) was intermediate. Similarly, conception rates to cows inseminated after observed estrus was 34.9% and was greater ($P < 0.05$) for Region 3 (37.2%) than Regions 1 (33.6%), 2 (33.1%), and 4 (33.1%). Whole herd 21-d pregnancy rates (17.8%) and AI 21-d pregnancy rates (18.5%) were similar among regions. The mean percentage of cows that became pregnant, relative to the total number of cows eligible to become pregnant in the herd, was 76.9% and did not differ among regions. We conclude that regional differences in reproduction exist in US dairies, specifically in the percentage of cows that are inseminated at TAI and following detection of estrus. In addition, reproduction responses vary among region in terms of multiple measures of fertility, which may be attributed to protocol compliance, heat detection efficiency, and differences in herd size.

Key Words: estrous synchronization, fertility, reproduction

T311 The effect of soy isolate source in milk replacer on growth and health of calves fed milk replacer. R. C. Musser*, B. L. Miller, T. J. Earleywine, and T. E. Johnson, *Land O'Lakes, Inc., Webster City, IA.*

Forty-eight (48) Holstein bull calves with an average initial weight of 44.2 kg were employed in a 42 d trial to evaluate 3 different sources of soy isolate in milk replacer (MR). Calves were allotted to treatment based upon weight and blood gamma globulin status. Calves were fed a 25% protein / 20% fat MR powder to provide 681 g DM feeding rate daily in 2 feedings. Calves were offered one feeding (340 g) per day during the week of weaning. Each MR contained soy isolate protein from one of 3 different sources-A, B and C-and were medicated (0.28 g neomycin:0.14 g oxytetracycline/kg). Soy isolate sources replaced 37.5% of the milk protein. Calf starter (20% CP as-fed) was fed throughout this 42-d trial. The Mixed procedure of SAS was used to analyze data. Source C was inferior ($P < 0.05$) in total weight gain, MR intake, starter intake and feed efficiency when compared with the other soy isolate sources. Soy isolate sources differ in ability to support calf performance.

Table 1. Soy Isolate Source

Item	A	B	C	SE
BW gain, kg	19.0 ^b	17.7 ^b	6.0 ^a	1.239
MR (DM), kg	23.3 ^b	22.9 ^b	21.1 ^a	0.526
Starter (DM), kg	14.9 ^b	13.6 ^b	8.9 ^a	0.447
Feed/Gain	2.12 ^a	2.12 ^a	5.29 ^b	0.372

^{a,b} Means within a row differ ($P < 0.05$).

Key Words: calf, milk replacer, soy isolate

T312 Non-dietary risk factors for lameness and their consequences in dairy cows. I. Guasch¹ and A. Bach*^{1,2}, ¹*Department of Ruminant Production, IRTA, Caldes de Montbui, Spain*, ²*ICREA, Barcelona, Spain.*

Forty-three herds (4,366 cows; herd average milk yield 26 \pm 2.8 kg/d) located in the Northeast of Spain feeding exactly the same ration were included in a survey aimed at determining non-dietary risk factors for lameness and potential consequences of lameness on herd performance. The survey was conducted within a 2-mo time span and each herd

was visited at least twice. All cows (dry and lactating) were evaluated using a 5-point locomotion scoring system by the same observer for lameness. Management parameters were gathered through a direct interview with the herd manager. Reproductive data were derived from historical records collected for an entire year. Daily milk yield and composition during the 2 mo before and the month that the farm visit took place was collected from the milk processor. Data were analyzed using linear regression analysis. Overall, average lameness (locomotion score ≥ 4) prevalence was $18 \pm 9.0\%$. No relationship was found between cubicle dimensions and lameness incidence. The frequency of bedding the cubicles (cushioning) was negatively correlated with lameness. Herds that moved cows between pens in groups of several animals had a lower incidence of lameness ($14.2 \pm 1.97\%$) than those that moved cows individually ($21.6 \pm 1.88\%$). Herds with an average age at first calving (AFC) > 27 mo had a greater lameness prevalence ($20.8 \pm 2.09\%$) than those with and AFC < 27 mo ($14.79 \pm 1.71\%$). Herds producing more than 27 kg/d had a lower lameness incidence ($12.9 \pm 2.35\%$) than those producing less than 27 kg/d ($20.3 \pm 1.64\%$). Herd milk efficiency (normalized for fat and protein) ranged from 1.03 to 1.52 kg of milk/kg of DMI and tended ($P = 0.06$) to decrease as lameness prevalence increased. Heat detection rate ranged from 26.5% to 72.3%, and decreased as lameness incidence increased. Management aspects such as moving cows in groups, AFC, and frequency of bedding are highly associated with lameness prevalence. Lameness may decrease herd profitability by, among other factors, compromising reproduction through poor heat detection and tending to reduce milk efficiency.

Key Words: lameness, housing, management

T313 Associations between several aspects of heifer development and dairy cow longevity. A. Bach^{*1,2}, ¹ICREA, Barcelona, Spain, ²Department of Ruminant Production, IRTA, Caldes de Montbui, Spain.

A data set from 8,549 heifers born between 2003 and 2006 including growth rates since birth until first calving, age and BW of insemination, and incidence of diarrhea and respiratory problems (RP) was used to evaluate potential associations between these factors and cow longevity. All heifers were raised in a contract heifer operation (Rancho Las Nieves, Mallen, Spain) and returned to their herds of origin (133 herds in total) before calving. Dates of death were provided by the Subdirección General de Explotaciones y Sistemas de Trazabilidad de los Recursos Agrícolas y Ganaderos from the Ministry of Environment, and Rural and Marine Areas of the Spanish Government. At the time of analysis, 3,138 animals out of the 8,549 considered had died. Age and BW before first calving was 727 ± 41.2 d and 661 ± 43.8 kg, respectively, with an overall ADG between 10 d of life and first calving of 873 ± 117.3 g/d. Average longevity for the 3,138 heifers that had died was $1,395 \pm 407$ d, with 10.4% of total cullings (or deaths) occurring within the first 50 DIM, and 30.9% of total cullings (or deaths) that did not complete the first lactation. Data were analyzed using a mixed-effects model accounting for the random effect of the farm of origin (and fate), year of calving, and their interaction. The number of RP that heifers experienced was the most significant parameter affecting longevity. Heifers that never incurred an RP had an average longevity of $1,606 \pm 126$ d, and this number progressively ($P < 0.001$) decreased to $1,511 \pm 129$ d in those that had experienced 4 or more RP. Heifers that completed the first lactation grew at a greater ($P < 0.05$) rate (875 ± 1.4 g/d) and were bred with a greater ($P < 0.05$) BW ($62.9 \pm 0.16\%$ of calving BW) than those that never finished it (861 ± 3.85 g/d and $60.9 \pm 0.26\%$ of calving BW, respectively). The consideration of these results, especially recurrences of RP and rate of growth, when making decisions on heifer

management has the potential to improve overall future herd profitability by increasing cow longevity.

Key Words: longevity, heifer, development

T314 Effects of heat stress and Niashure (NI) supplementation on winter acclimated lactating cattle. S. Rungruang^{*1}, R. P. Rhoads¹, L. H. Baumgard¹, M. DeVeth², J. L. Collier¹, and R. J. Collier¹, ¹University of Arizona, Tucson, ²Balchem Corp, New Hampton, NY.

A replicated design with 24 multiparous high producing dairy cows (40 ± 1.4 kg/d) was utilized to evaluate a dose range of dietary NI (0, 4, 8, or 12 g/d) in winter acclimated lactating dairy cows on body temperature indices, sweating rate, feed intake, water intake, production parameters and blood niacin concentrations under thermoneutral (TN) and heat stress (HS) conditions. Temperature Humidity Index (THI) values for TN never exceeded 65 while THI values during HS were above 72 (stress threshold) for 12 h/d. The HS environment increased skin, rectal and vaginal temperatures, respiration rate, sweating rate and water intake and decreased feed intake (4 kg/d, $P < 0.01$), milk yield (3.4 kg/d, $P < 0.01$) and milk protein (0.18 g/100 mL, $P < 0.01$). Sweating rate increased during HS ($13 \text{ g/m}^2 \text{ h}$, $P < 0.01$) compared with TN, but this increase was 10-fold lower than reported in summer acclimated cattle. NI supplementation had no effect on sweating rate, dry matter intake, milk yield and composition in either environment. Dietary NI increased blood ($P < 0.07$) and milk ($P < 0.02$) niacin concentrations in a linear manner. Heat stress reduced blood (7.82 vs. 6.63 $\mu\text{g/mL}$, $P < 0.01$) but not milk niacin concentration. Reduced blood niacin concentration was partially corrected by dietary NI. Dietary NI linearly increased water intake ($P < 0.02$) in both environments but the increase was greater during HS conditions ($P < 0.03$). Dietary NI also increased skin temperature in both environments ($P < 0.01$) from both shaved and unshaved skin in a dose-dependent manner ($P < 0.01$) but the increase was greatest from shaved skin ($P < 0.04$). This suggests skin blood flow was enhanced with increasing NI dose. Results indicate that HS decreased blood niacin concentration in lactating dairy cows and that NI supplementation partially restored blood niacin concentration during HS. Dietary NI increased water intake and skin temperature. There may be seasonal differences in sweating rate responses to HS and NI.

Key Words: niacin, heat stress, cattle

T315 A preliminary investigation of individual variation in N excretion by lactating dairy cows. P. Gregorini^{*}, P. Beukes, A. Romera, C. Clark, and D. Clark, DairyNZ, Hamilton, Waikato, New Zealand.

Dairy systems are under pressure to reduce their environmental footprint, and N excreted from cows is a primary concern. Three data sets were separately analyzed to explore the animal variability in N excretion, and associations among genetic merit, live weight, DMI and N excretion parameters. This was a preliminary step in evaluating the potential for genetic selection for reduced urinary N (UN) and milk urea N (MUN) concentrations. Data sets consisted of cows fed a) Total mixed ration (TMR), b) Grazing fresh pasture (GR), and c) fresh pasture indoors (IG). Data sets contained 372, 144 and 90 measurements, respectively. Cows in GR and IG were identified by profit-based genetic evaluation in relation to ability to breed efficient replacements (BE) and produce efficiently (PE). Data sets were analyzed using mixed models. Cow variance components were estimated using models that included treatment and period as fixed effects and cow and period within cow as random effects. Associations among the UN, MUN, BE, PE, DMI, and live weight were determined using random coefficient regression for TMR. For GR and IG, pooled within-treatment regression was used. Analyses

indicated a significant ($P < 0.001$) cow variance component for MUN (13 ± 3.9 mM/L) in TMR, MUN (7.7 ± 1.8 mM/L) and UN (1.2 ± 0.4 g/L) in GR, and UN (7.8 ± 1.0 g/L) in IG, with greater variation between cows than within-cow for each data set. In TMR, UN was positively associated ($P < 0.01$) with live weight and N intake. In GR, UN was negatively associated with PE ($P < 0.05$), but not BE. Live weight was positively associated ($P < 0.01$) with UN. With IG, genetic merit, neither live weight nor DMI was associated with MUN. None of the experiments were designed to study within- and between-cow variation in UN or MUN specifically, so caution must be applied when drawing inferences from these analyses. However, the analyses indicate consistent individual cow variation, suggesting a need for further research to explore the possibility of genetic selection for variation in N excretion.

Key Words: N excretion, dairy cow, genetics

T316 Repeatability coefficients for dry matter intake and efficiency of nitrogen utilization for milk production in lactating Holstein cows challenged with low N diets. N. B. Kristensen*, T. Hvelplund, M. R. Weisbjerg, P. Lund, and P. Løvendahl, *Aarhus University, Tjele, Denmark.*

Data from 63 cows fed 4 different diets varying in nitrogen (N) content in a multiple Latin square design with 2 tests, 8 blocks per test, 4 experimental periods of 14 d, and 4 treatments within block were used to estimate repeatability coefficients for dry matter intake, milk production traits, and efficiency of nitrogen utilization for milk production (ENU). Cows were blocked according to parity and days in milk. Diets were composed of corn silage, rolled barley, grass clover silage, and N adjusted by substituting soyhulls and cane molasses for soybean meal (120, 80, 40, and 0 g/kg DM) with a fixed proportion of soyhulls to molasses of 4 to 1. Diets contained 167, 150, 134, and 121 g crude protein/kg DM for the 4 soy levels, respectively. The study included 24, 25, and 14 cows of 1st, 2nd, and +3rd parity and cows were in average (mean \pm SD) 160 ± 28 , 180 ± 47 , and 136 ± 30 d in milk by the first sampling period for the 3 parities, respectively. Repeatability coefficients were estimated in a linear mixed model containing the fixed effects of treatment, treatment \times test, and experimental period \times test and the random effect of block \times test as well as random intercept, linear- and quadratic effects of treatment with subject = the individual cow. Repeatability coefficients were calculated as the variance component estimate for intercept / intercept + residual. The following repeatability estimates were obtained: dry matter intake, 0.77; milk yield, 0.57; energy corrected milk, 0.38; fat yield, 0.55; protein yield, 0.39; ENU, 0.52. Including BW and BW \times treatment as fixed effects in the model reduced the estimates for energy corrected milk, 0.18 and protein yield, 0.093, however, the estimate for ENU (0.55) did not decrease, suggesting that ENU is a trait of the individual cow without being a function of its body weight. The estimated high repeatability coefficient for ENU further suggests a possibility for genetic improvement of N efficiency of dairy cows.

Key Words: repeatability coefficients, nitrogen utilization, dairy cows

T317 Metabolic profile and postpartum health in early lactating Holstein cows in southern Brazil. T. A. Frigotto¹, S. O. Juchem², R. D. Ollhoff³, I. R. Barros Filho¹, P. Schmidt¹, and R. Almeida*¹, ¹Universidade Federal do Paraná, Curitiba, PR, Brazil, ²University of California, Davis, ³Pontifícia Universidade Católica do Paraná, Curitiba, PR, Brazil.

Objectives of the study were to describe the concentrations of serum metabolites and the occurrence of diseases in a group of parturient

cows from commercial dairy herds. Two high-producing dairy herds in the county of Arapoti, Brazil, were monitored from April to July of 2009, resulting in data collection from 105 dairy cows (73 multiparous and 32 primiparous). Blood was withdrawn on d 1, 2, 5, and 10 after calving, and serum analyzed for non-esterified fatty acids (NEFA), β -hydroxybutyrate (BHBA), and calcium (Ca). Continuous data was analyzed as repeated measures, whereas dichotomous data was analyzed with Fisher exact test. The statistical model included the fixed effects of herd, parity, time, and appropriate interactions. Concentration of NEFA in serum decreased ($P < 0.01$) as DIM increased (d1 = 0.73; d5 = 0.62; and d10 = 0.51 mmol/L). Concentrations of NEFA were similar ($P > 0.05$) between herds, but multiparous cows had higher ($P < 0.05$) concentrations of NEFA than primiparous cows (0.71 vs. 0.53 mmol/L). Concentrations of BHBA were highest ($P < 0.05$) at d5 (d1 = 0.45; d5 = 0.59; d10 = 0.43 mmol/L). There was no ($P > 0.05$) difference on BHBA concentrations between first-lactation and mature cows. Concentrations of Ca in serum were similar ($P > 0.05$) between farms (10.5 vs. 10.7 mg/dL) and parity (10.7 vs. 10.6 mg/dL). The incidence of dystocia, displaced abomasum, clinical hypocalcemia, mastitis and subclinical ketosis were similar ($P < 0.05$) between herds and parity. Incidence of retained placenta was higher in primiparous cows from herd A ($P > 0.05$) than herd B (50 vs. 15%), but similar within multiparous cows (28.6 vs. 23.7%). Multiparous cows from herd A had higher incidence of metritis than herd B (28.6 vs. 5.1%; $P = 0.02$). Primiparous cows had higher incidence ($P < 0.01$) of udder edema than multiparous cows (40.6 vs. 11.0%). Milk production was similar between primiparous cows across herds (31 vs. 31 kg/d), but multiparous cows from herd A produced more milk from 14 to 56 DIM (46.5 vs. 39.7 kg/d). Parity and DIM are important sources of variation when monitoring metabolic parameters and evaluating disease incidence of transition cows.

Key Words: NEFA, BHBA, calcium

T318 Factors affecting the bulk tank milk quality collected by a dairy industry of Minas Gerais state, Brazil, from 2002 to 2008. C. A. V. Paiva, A. F. Cunha, M. O. Leite, R. Rodrigues, C. F. A. M. Pena, A. M. Q. Lana, M. Houri Neto, L. M. Fonseca, M. R. Souza, and M. M. O. P. Cerqueira*, *Federal University of Minas Gerais state, Belo Horizonte, Minas Gerais, Brazil.*

Objectives were to determine the bulk tank milk quality in compliance with the Brazilian Ministry of Agriculture standards (IN51) and the effect of total bacterial count (TBC) and somatic cell count (SCC) on protein, fat, and solids nonfat solids (SNF) content, as well as on the milk powder yield. A total of 60,243 milk samples were collected on farms in the state of Minas Gerais, Brazil, from 2002 to 2008. The TBC and milk composition and SCC were performed using Bactocount IBC and CombiSystem 2300 (Bentley Instruments Inc.). The results were analyzed by Chi-squared. From 2002 to 2008, the volume of milk (%) in compliance with IN51 increased 11.58% for TBC and 1.4% for protein while it decreased 3.33% for SCC, 2.05% for fat, and 4.07% for SNF. The frequencies of samples (%) in compliance with IN51 regarding TBC, SCC and contents of fat, and NFS were higher ($P < 0.05$) during the dry (72.88, 92.63, 96.27, and 90.65, respectively) than the rainy season (66.55, 90.35, 91.26, and 89.49, respectively). For protein, these frequencies were similar ($P > 0.05$) during the dry (97.72%) and rainy seasons (97.52%). The seasonal variations influenced the bulk tank milk quality. TBC and SCC varied more and had lower means during the dry (5.12 logCFU + 1/mL and 5.41 log SCC + 1/mL, respectively) than the rainy season (5.16 log CFU + 1 and 5.44 log SCC + 1/mL, respectively). Means (%) of fat, protein and SNF were higher during the dry (3.81, 3.30, and 8.82, respectively) than the rainy

season (3.61, 3.26, and 8.79, respectively). Seasonality influenced fat and protein and at the rainy season, SCC and TBC may have decreased the milk solids. Milk powder yield was higher in the dry season due to the highest solids content of milk. However, the total production of kg of solids was lower due to the lower volume of milk collected in that season. Indeed, seasonality influenced all the studied parameters and it may have affected milk powder yield.

Financial support: FAPEMIG

Key Words: milk, quality, factors

T319 Evolution of milk production and premium payment for total bacterial count, somatic cell count, fat and protein contents in a dairy industry of Minas Gerais state, Brazil.

C. A. V. Paiva, A. F. Cunha, M. O. Leite, R. Rodrigues, C. F. A. M. Pena, L. M. Fonseca, A. M. Q. Lana, M. Hourri Neto, M. R. Souza, and M. M. O. P. Cerqueira*, *Federal University of Minas Gerais state, Belo Horizonte, Minas Gerais, Brazil.*

Objectives were to characterize milk quality parameters in the state of Minas Gerais, Brazil, from 2002 to 2008. A total of 60,243 raw bulk tank milk samples were collected and analyzed for total bacterial count (TBC), SCC, fat and protein. Results were tabulated according to year and then related to the volume of milk produced and value paid to the producers according to a system of payment for quality established by the local industry. Descriptive analyses were performed to report results. For all 4 parameters used in the payment for milk quality (TBC, SCC, fat and protein contents), the value paid to the producer increased. However, not all parameters followed the same pattern. TBC and SSC followed distinct trajectories. The volume of milk that received premium payment for TBC increased 27.18% between 2005 and 2008, and the average premium payment for TBC increased 3.15% in the same period. In relation to SCC, the volume of milk that received a premium payment decreased 27.52% between 2005 and 2008, but the premium payment for SCC increased 58.89% in the same period. The average fat content decreased, whereas the protein content increased in the period evaluated. The volume of milk that received premium payment for fat content was reduced 0.92% between 2005 and 2008, but the average premium payment for fat content increased 14.38% in the same period. The volume of milk that received premium payment for protein content increased 61.86% between 2005 and 2008. The average premium payment for protein content increased 69.60% between 2005 and 2008. It is necessary to monitor and to evaluate the parameters used in the payment of milk quality so that it has, in fact, a continuous improvement of the productive processes and the economic index.

Key Words: milk, quality, payment system

T320 Comparison of different methods of rearing management in Holstein dairy calves.

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Milk consumption, dry feed intake, body weight (BW) gain and occurrence of diarrhea were studied in male Holstein calves fed milk either through conventional or step-down (STEP) methods. A completely randomized design was used in this study. In conventional method, the calves (n = 9) were fed colostrum and then milk at the rate of 10% of BW for the entire period of 45 d. In STEP method, the calves (n = 9) were given colostrum and then milk for 25 d at the rate of 20% of BW in 2 meals and another calves (n = 9) in 3 meals for 25 d, which was reduced (between d 26 to 30) to 10% of BW for the remaining 15 d. The calves fed through conventional and STEP methods were weaned gradually by milk diluting with water between d 46 and 50. Feed intake

and BW of the calves were monitored until 90 d of age. The STEP calves consumed more milk than conventionally fed calves during the pre-STEP (d 1 to 30) and post-STEP (d 31 to 50) periods ($P < 0.01$). Consumption of starter in calves provided milk using conventional method compared with STEP-fed calves was greater during the pre-STEP period and there was no significant difference during the post-STEP and postweaning (d 51 to 90) periods. Body weight gain (8.5, 18.7 and 21.3 kg/30 d, $P < 0.001$, respectively) and feed efficiency (0.37, 0.49 and 0.55, $P < 0.001$, respectively) of calves were greater in those on the STEP method during the pre-STEP period than on the conventional method and were numerically higher during post-STEP and post-weaning. There was no significant difference in occurrence of diarrhea in calves fed milk through conventional method compared with STEP-fed method. Increasing number of milk meals tended to increase body weight gain (65.4 vs. 70.7 kg/90 d, $P < 0.17$). In conclusion, STEP milk feeding may prevent the problems of depressed solid feed intake associated with ad libitum milk feeding and of poor BW gain with conventional milk feeding in dairy calves.

Key Words: weaning, starter, Holstein bull calves

T321 Differences between expanding and non-expanding Wisconsin dairy farms.

J. M. Janowski and V. E. Cabrera*, *University of Wisconsin, Madison.*

A survey was administered (September 2009 to January 2010) to a sample of 1,000 randomly selected Wisconsin dairy producers to discern differences between those planning to expand and those not planning to expand their operations. A total of 300 dairy producers (30%) across 33 counties in Wisconsin completed the survey. Results indicated 33% of dairy producers planned to expand their dairies in the future. The majority planned to grow their herds from within. Significant differences between dairy producers and their operations were found regarding producer age, producer experience, farm herd size, and land per cow. Low net profit was the top issue hampering growth and modernization for producers planning to expand. Most producers not planning to expand were satisfied with their current operation size and did not feel expansion was necessary. Producers planning to expand cited an increase in net farm income as their most important motivation, while producers not planning to expand wanted to keep the farm at its best size given available labor. Dairy producers planning to expand were interested in receiving more information about financial planning, profitability measures, and financial efficiency. Producers not planning to expand were interested in topics regarding reproduction and financial efficiency. Results provide evidence toward development of risk management and financial management programs tailored for expanding and non-expanding dairy producers.

Table 1. Characteristics of expanding and non-expanding dairy operations

	Planning to expand (n = 78)	SD	Not planning to expand (n = 222)	SD	P-value
Producer age (yr)	47.08	10.70	51.19	10.70	0.01
Producer experience (yr)	25.33	12.99	29.15	12.14	0.04
Farm herd size (#)	247.35	362.97	82.11	117.03	0.00
Farm land per cow (ha/cow)	0.94	1.06	1.73	2.18	0.00

Key Words: expansion, modernization, survey

T322 Effect of heat stress on pregnancy rate of dairy cows using artificial insemination or embryo transfer in commercial dairy farms of central Mexico (Aguascalientes). R. Lozano¹, E. Gonzalez-Padilla², C. Vazquez², C. F. Arechiga^{*3}, and J. M. Silva³, ¹Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias, Pabellón, AGS, Mexico, ²Universidad Nacional Autónoma de México, Mexico, D.F., ³Universidad Autónoma de Zacatecas, Zacatecas, Mexico.

Objective of present study was to evaluate the effect of heat stress on pregnancy rates of Holstein cows using artificial insemination or embryo transfer in commercial dairies from central Mexico (Aguascalientes, Mexico). The study was carried out in 2 commercial dairy herds during 2 seasons of the year: Warm (May 1 to August 17) and Temperate (January 15 to March 27). Cows included in the study were randomly allotted into 2 groups: 1) artificially inseminated (n = 682) and 2) embryo-recipient cows (n = 107). Days in milk (DIM), milk estimated production to 305 d (P305D); and the index temperature-humidity (THI) were recorded during both seasons. Data was evaluated through descriptive statistics. Pregnancy rate was evaluated in recipient cows and analyzed through a first-order multiple logistic regression analysis. DIM of cows in study (86.7 ± 2.8) were similar for both times and reproductive techniques ($P > 0.05$). P305D in recipient cows (9,261.8 ± 192.3) was higher than the observed in cows that were inseminated (8,397.9 ± 84.9; $P < 0.01$). As expected, THI was higher during warm season (76.7 ± 0.3) compared with temperate season (70.3 ± 0.3; $P < 0.05$). Pregnancy rate decreased during the warm season (21.1%) compared with the temperate season (35.9%; $P < 0.01$) for both AI and ET. Pregnancy rates were similar using artificial insemination (32.9%) and embryo transfer (24.9%; $P > 0.05$). Embryo transfer did not improve pregnancy rate over artificial insemination of Holstein cows exposed to heat stress conditions present during the summer in central Mexico (Aguascalientes).

Key Words: heat stress, embryo transfer, pregnancy rate

T323 Calculating field nutrient removal rates to comply with General Order for Existing Milk Cow Dairies from California's Central Valley Regional Water Quality Control Board. J. M. Heguy*, B. M. Karle, P. L. Price, and D. Meyer, *University of California, Davis.*

The Dairy General Order requires dairy operators to document total weight of nutrients removed from fields where manure is applied. A detailed protocol requires sub-sampling (n = 8) from each 16.19 ha, with additional composites made to represent morning and afternoon harvest periods for dry matter (DM). Analysis of forage DM forms the basis for all nutrient removal calculations. A single composite sample for each field is prepared for nutrient analyses. Field observations indicated the detailed sampling protocol was not generally followed at dairies. The objective of this study was to determine if differences exist in calculating DM removal based on various intensities of sub-sample and composite collection. Weights were obtained and samples collected for each truck-load (TL) of forage harvested from 3 fields after unloading at the silage pit. Each sample was sealed in a plastic bag and placed on ice. Dry matter was determined for each sub-sample by drying 25–40 g, in triplicate, in a 55°C oven for 24 h, then weighing the dry residual. DM is dry weight divided by wet weight. Actual field DM removal was determined by summing TL × DM for all samples from the field. Field DM removal totals were calculated using 3 composite sampling models (sequence, interval, and period). Sequence values are the average of sample DM within each hour of harvest. Interval values are the average of every 10th sample. Period values represent averages of samples collected in am or pm on each day. Mean ± standard deviation (SD) sequence DM percent ranges were 27.23 ± 1.43 to 29.62 ± 1.64; 21.21 ± 1.45 to 24.57 ± 2.04; and 27.88 ± 1.03 to 31.71 ± 1.81, for Dairy 1, 2 and 3, respectively.

Mean ± SD interval DM percent ranges were 27.26 ± 0.90 to 29.06 ± 2.19; 22.49 ± 1.57 to 23.36 ± 1.28; and 29.04 ± 2.40 to 30.65 ± 2.10, for Dairy 1, 2 and 3, respectively. DM percent of am/pm composites were: Dairy 1 (27.74 ± 1.51/29.00 ± 1.62); Dairy 2 (23.72 ± 1.78/22.53 ± 1.39/22.86 ± 1.43); and Dairy 3 (29.71 ± 2.05/31.97 ± 2.18).

Key Words: regulation, sampling, forage

T324 Association of production level and calving season with reproductive function of Holstein cows from an intensive dairy production system of central Mexico (Aguascalientes, Mexico). P. Hernandez-Briano¹, C. F. Arechiga^{*1}, J. I. Aguilera-Soto¹, M. A. Lopez-Carlos¹, M. Rincon¹, J. M. Silva¹, C. A. Medina-Flores¹, and R. Lozano², ¹Universidad Autónoma de Zacatecas, Zacatecas, Mexico, ²Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias, Pabellón, Ags, Mexico.

Objective of present study was to determine factors influencing productive and reproductive function of Holstein cows in an intensive dairy productive system in central Mexico (Aguascalientes, Mexico). Effects of calving season (CS) and milk production level (MPL) on number of services (NS), interval from calving to conception (ICC) and interval from calving to next calving (ICNC) of Holstein cows (n = 363) from January 1st 2008 to March 29th 2009 was evaluated. Data was analyzed by SAS proc GLM as fixed effects of CS, parity (PAR), milk production level (MPL), age of cow and interactions. High-producing Holstein cows (above 20 kg/d; elevated MPL x = 9,644 kg/lactation), required a higher NS (3.4 vs. 2.6), a greater ICC (174.2 vs. 130.9 d), and a greater ICNC (446.9 vs. 401.2 d), compared with low-producing Holstein cows (below 20 kg/d; x = 6,410 kg/lactation). According to CS, it was found that cows calving during cool season of the year and bred during the summer presented a greater NS (3.7 vs. 2.8), a greater ICC (187.2 vs. 140.9 d) and a greater ICNC (467.9 vs. 412.7 d) in comparison to cows calving during the hot season of the year. Probably, due to inseminations carried out during the hot months of the year. Moreover, 2 years-old cows (PAR 1), presented a lower ICC compared with cows with PAR 2 and/or greater ($P < 0.05$). In conclusion, a high MPL, CS and PAR compromised significantly productive and reproductive parameters of Holstein cows from an intensive dairy in Central Mexico (Aguascalientes, Mexico).

Key Words: dairy cow, milk yield, heat stress

T325 Bacterial survival rate in sanitizing teat dips for dairy cows. S. Retz and S. I. Kehoe*, *University of Wisconsin-River Falls, River Falls.*

It is common practice to apply a teat dip before and after milking to prevent mammary infections from occurring in dairy cows. Teat dips commonly contain a sanitizer and emollient to reduce bacterial invasion and keep teat skin from drying and cracking. Many dairies use a dip cup which has a container attached where the teat dip is kept to apply pre and post milking. The person milking squeezes the container to fill the cup and then dips the cows. To save teat dip, multiple cows are dipped using the same fluid. Because the fluid contains a sanitizing agent, few people are concerned about bacterial transfer. Therefore, our objective was to determine whether there were any bacteria surviving after dipping multiple cows. One teat dip container and cup were cleaned and filled with 0.1% iodine teat dip. Teat dip was used on 2 cows and then swabbed on a Minnesota Easy Culture System II triplate (Minneapolis, MN). This process was redone a total of 6 times over 4 random days. Results showed a numerically increasing trend ($P < 0.09$) for growth of gram-positive species by sampling time (7.98, 8.69, 19.69, 43.13, 21.41,

and 18.96 cfu). Growth of streptococcus and gram-negative species were not significant however increased numerically (0.39, 0.39, 0.96, 1.25, 1.10, and 1.53 cfu for streptococcus spp. and 0.32, 0.14, 0.61, 1.75, 0.32, and 1.04 cfu for gram-negative spp.). It can be concluded that there is some survival of bacteria as well as further growth. These results indicate that more research is needed to determine other variables such as type of teat dip.

Key Words: teat dip, cows, bacteria

T326 Stage of lactation alters production responses of cows subjected to feed restriction. V. Bjerre-Harpøth, N. C. Friggens, V. M. Thorup, K. L. Ingvarsen, and K. M. Moyes*, Aarhus University, Tjele, Denmark.

Our objective was to determine the effect of stage of lactation on production responses of cows during feed restriction (FR). Forty-seven healthy Holstein dairy cows in early (E; n = 14; 0–90 DIM), mid (M; n = 15; 91–220 DIM) and late (L; n = 18; 221–355 DIM) lactation were used. Of these, 26 cows were primiparous and 21 cows were multiparous. At the beginning of the study, all cows were fed a standard TMR for ad libitum intake. After 8-d, all cows were FR to provide ~40% of NE_L requirements based on body weight, milk production and composition by supplementing the standard TMR with 60% wheat straw. After 4-d of FR, cows returned to full feed. At each milking, milk yield was recorded and composite milk samples were collected automatically and analyzed for % fat, protein, and lactose and concentration of BHBA and MUN (mM). For each cow, the change in each variable was calculated as average [before] – [during] FR. The MIXED procedure of SAS was used to determine the effect of stage of lactation on production responses during FR. Stage of lactation did not affect ($P > 0.05$) changes in fat and MUN but changes in lactose and daily milk yield (kg/d) were greater ($P < 0.05$) in E (0.18 ± 0.02 and 11.6 ± 1.3 , respectively) than M (0.08 ± 0.02 and 8.9 ± 1.2 , respectively) or L cows (0.13 ± 0.02 and 8.9 ± 1.1 , respectively). Changes in protein were greater in both E (0.24 ± 0.03) and M cows (0.28 ± 0.03) than L cows (0.07 ± 0.02). However, greater changes in BHBA ($\log[mM]$) were observed in M (0.13 ± 0.06) and L cows (0.06 ± 0.06) than E cows (-0.33 ± 0.06). One week after FR, all cows returned to production levels similar to those observed before FR. Our results show that cows in early lactation respond differently to feed restriction than cows in mid or late lactation. These results provide insight into the homeorhetic mechanisms controlling the partitioning of nutrients of dairy cows during early lactation and should be beneficial for our understanding of how to maintain animal health and productivity throughout the lactation cycle.

Key Words: cow, stage of lactation, feed restriction

T327 The effects of dietary ThermalCare-R (TCR) on body temperature indices, production and metabolism in heat-stressed lactating cows. R. P. Rhoads*, M. V. Skrzypek¹, S. S. Block², and L. H. Baumgard³, ¹University of Arizona, Tucson, ²Archer Daniels Midland, Decatur, IL, ³Iowa State University, Ames.

Multiparous Holstein cows (n = 22; 115 ± 5 DIM, 582 ± 41 kg BW) housed in climate chambers were individually fed a TMR consisting primarily of alfalfa hay and steam flaked corn. Cows were randomly assigned to 1 of 2 treatments: a diet containing TCR (a fermentation material and botanical product for heat stress, n = 11, 45.4 g/d) or control diet (n = 11). Trial length was 21d consisting of a 7d thermal-neutral (TN) period (18°C, 20% humidity) followed by 14d of heat stress (HS; cyclical daily temps ranging from 31.1 to 38.9°C and 20% humidity, maximum heat was at 1300 h). TCR feeding had little or no effect on

body temperature indices during TN conditions. During HS and compared with controls, TCR-fed cows tended to have a reduced rectal temperature at 1300 h (40.29 vs. 40.11 °C; $P = 0.08$) and a higher shaved rump skin temperature at all time points (37.35 vs. 37.67 °C; $P < 0.01$). TCR-fed cows also had an increased respiration rate at all time points during HS (78 vs. 83 BPM; $P < 0.02$). Overall, TCR-fed cows tended to consume less feed (21.9 vs. 22.5 kg/d; $P = 0.06$) but the decrease during HS was not as severe in TCR-fed cows compared with controls (4.8 vs. 6.0 kg/d; $P < 0.05$). Cows fed TCR had an overall (independent of environment) increase in milk fat content (3.96 vs. 3.67; $P < 0.01$) and tended to have increased milk protein levels compared with controls (2.78 vs. 2.71; $P = 0.07$). Overall TCR-fed cows produced more milk (0.5 kg/d; $P < 0.05$) and the difference became larger when evaluated on a FCM and ECM basis. During HS, both groups had a similar milk yield reduction (6.1 kg/d). TCR-fed cows had improved feed efficiency (12%; $P < 0.01$) and both groups lost a similar amount of BW (21.5 kg) during HS. During HS, plasma NEFA levels did not change but glucose levels decreased (5%; $P < 0.05$), PUN increased (27%) and TCR-fed cows had overall increased PUN levels (12.7 vs. 11.6 mg/ml; $P < 0.01$). Feeding TCR improved some body temperature indices and production variables in heat-stressed cows.

Key Words: heat stress

T328 Effect of increased omega-3 fatty acids on production and reproduction in high producing lactating cows during cool season and hot season conditions. T. Colburn*, K. D. Murphy¹, C. Walhof², and A. V. Grove³, ¹Virtus Nutrition, LLC, Corcoran, CA, ²Valley Veterinarians, Inc., Tulare, CA, ³AG Research, LLC, White Sulphur Springs, MT.

High-producing cow diets contain large quantities of polyunsaturated fatty acids, primarily omega-6 fatty acids. This results in a high omega-6:omega-3 ratio of fatty acids flowing to the small intestine. This elevated ratio may reduce optimal production and reproduction. We hypothesize that increasing dietary omega-3 fatty acids will result in improved production and reproductive parameters in lactating cows during cool season and hot season conditions. Five hundred multiparous Holstein cows were used to evaluate the effect of 2 omega fatty acid nutrition programs on milk yield and conception rates during 2 periods (summer vs. rest of year). Cows were randomly assigned to either control or treatment diets. All cows were supplemented with 113 g omega-6 fatty acid supplement from -21 d prepartum to 21 d postpartum. From 22 to 150 d postpartum, control cows received 225 g calcium salts of long chain fatty acids and cows in the treatment group received 113 g calcium salts of long-chain fatty acids and 113 g of primarily polyunsaturated omega-3 eicosapentanoic (EPA) and docosahexanoic (DHA) calcium salts of fatty acids. Diets were balanced to be isonitrogenous, isolipidic and isocaloric. Peak milk production was greater ($P = 0.02$) in cows in the treatment vs. control groups 51.4 vs. 50.1 kg/d, respectively. Treatment diet tended ($P = 0.06$) to increase conception rate for the 1st insemination during the period covering the entire year, 45.6% for cows consuming the treatment diet and 30.7% for the control cows. Conception rates tended to be associated ($P = 0.07$) with time of year for cows inseminated for the combined 1st and 2nd insemination times, 36.7% during the summer vs 29.4% for the rest of the year. Modifying dietary concentrations of omega-6 and omega-3 fatty acids had positive effects on production and reproduction in lactating cows.

Key Words: dairy cow, calcium salts of fatty acids, omega-3

T329 Effect of thermal stress, cistern size, and milking frequency on plasma mineral concentrations in Holstein dairy cows. R. Ben Younes¹, M. Caccamo*², I. Schadt², M. Ayadi³, T. Najar¹, M. Ben M'Rad¹, and G. Caja⁴, ¹*Institut National Agronomique de Tunisie, Tunisia*, ²*CoRFiLaC, Regione Siciliana, Ragusa, Italy*, ³*Institut Supérieur de Biologie appliquée de Médenine, Tunisia*, ⁴*Universitat Autònoma de Barcelona, Bellaterra, Spain*.

The study was carried out in 2006, in North Tunisia using 28 Holstein cows (169 ± 16 DIM) producing in average 18.0 ± 5.1 L/cow/d. Cows were classified according to udder cistern size, using a randomized block design, by ultrasonography to large-cisterned (47 cm² ± 17; LC) and small-cisterned (23 cm² ± 8; SC). The experiment was conducted in 4 times, April 5 (T1), July 18 (T2), August 18 (T3), and September 18 (T4). In each test day temperature and relative humidity data were registered hourly and cows' blood was sampled from the jugular vein to determine serum concentrates of minerals (P, Fe, Ca, Mg, K, Na, Cl). In T1 and T2, cows were daily milked twice (2X). Immediately after T2, within each group, cows were randomly assigned to 2 levels of milking frequency: 2 times per day (2X) and 3 times per day (3X). To evaluate the effects of period and cistern size, only 2X events were considered. To assess effects of milking frequency, only T3 and T4 were considered. Mean THI values were 62 ± 2, 79 ± 2, 84 ± 2, and 77 ± 1 in T1, T2, T3, and T4, respectively. The concentration of each single mineral was affected by test day ($P < 0.02$), but neither by cistern size nor milking frequency. Minerals concentration least squares means in T1, T2, T3, and T4, respectively, are reported in Table 1. Some minerals, such as Fe, P, Mg, and K, seemed to be lowered through heat stress only after a certain period of exposure to stress. Heat stress should be considered especially for the nutrition of the close-up dry cows group and of cows within 72 h of calving.

Table 1. Least squares means of minerals concentrations

Minerals	T1	T2	T3	T4
P (mg/L)	64.29 ^a	64.75 ^{ab}	56.50 ^{bc}	51.89 ^c
Fe (mg/L)	1.03 ^a	0.98 ^a	1.01 ^a	0.81 ^b
Ca (mg/L)	89.27 ^a	69.17 ^c	79.79 ^b	66.64 ^c
Mg (mg/L)	22.27 ^a	22.04 ^a	22.93 ^a	19.75 ^b
K (mmol/L)	4.91 ^a	4.89 ^a	4.76 ^{ab}	4.59 ^b
Na (mmol/L)	140.94 ^a	133.04 ^b	136.73 ^b	127.17 ^c
Cl (mmol/L)	101.67 ^a	94.48 ^b	97.75 ^b	89.87 ^c

Superscripts within rows differ by $P < 0.05$.

Key Words: heat stress, plasma minerals, temperature humidity index

T330 Body growth of pregnant Holstein heifers reared on pasture or conventional diet. R. R. Peters*¹, S. W. Fultz², J. W. Semler³, and R. A. Erdman¹, ¹*University of Maryland, College Park*, ²*University of Maryland Extension, Frederick*, ³*University of Maryland Extension, Boonsboro*.

Interest in grazing to reduce feed costs and increase profitability has increased in Maryland. To develop internal expertise, grazing work was initiated at our research unit. Study objective was to compare body growth of pregnant Holstein heifers on pasture (P) vs. conventional (C) diets. Between June 10 and Dec. 1, 2009, heifers were alternately assigned to either P or C diets based on date of pregnancy confirmation. One month before predicted parturition date, animals were moved to maternity pens. Both P (n = 16) and C (n = 15) fed heifers were located in adjacent areas. Heifers fed conventional TMR included corn and rye silage, grass hay, and a monensin supplemented grain mix. Pasture

reared heifers received no supplemental feed or minerals. Unimproved permanent pasture consisted primarily of endophyte-infected tall fescue. Heifers were rotated daily to a new paddock of approximately 0.1 to 0.3 ha, based on available DM. Measurements included body weight (BW), wither height (WH), hip height (HH), and body condition score (BCS) taken every 2 wk. Data collected for heifers on study for at least 70 d was fitted by quadratic regression to generate growth curves by individual animal. First derivatives of regression equations were used to estimate average growth rates for BW, WH, and HH. Equations of Heinrichs and Hargrove (J. Dairy Sci. 70:653–660, 1987) were used to compare actual growth rates to standard expected growth rates for heifers of this age and breed. Heifers on P had reduced ($P < 0.001$) ADG and BCS while skeletal growth rates (WH, HH) were similar to C. We conclude that P could be used without effect on skeletal development but it did have an impact on BW gain and BCS.

Table 1.

Growth Measure	Pasture	Conventional	SEM	P value
ADG, kg/d	0.42	1.11	0.034	0.001
Expected ADG, kg/d	0.58	0.59	0.025	0.773
WH gain, cm/d	0.041	0.050	0.004	0.376
Expected WH gain, cm/d	0.037	0.036	0.002	0.942
Mean HH gain, cm/d	0.062	0.044	0.001	0.320
BCS	2.87	3.11	0.044	0.001

Key Words: pasture, heifer growth

T331 Postpartum reproduction and NEFA changes during early lactation in Holsteins, Jerseys and their crosses. K. L. Brown*, B. G. Cassell, M. L. McGilliard, M. D. Hanigan, and F. C. Gwazdauskas, *Virginia Polytechnic Institute and State University, Blacksburg*.

One hundred sixty-three cows in first and second (n = 111) lactation were sampled to determine if reproduction and NEFA differed between breeds. Thirty-four cows were Holstein-Jerseys (HJ) crosses, 49 were Jersey-Holsteins (JH) crosses, 51 were Holsteins (HH), and 29 were Jerseys (JJ). Blood samples were collected weekly for 10 wk postpartum. Statistical analyses were by MIXED models. Season were cold (November to May) and hot (June to October). Days open were affected by breed and year-season ($P < 0.019$). The days open for HH were 151.1 ± 8.4 d and not different for HJ (133.7 ± 14.1 d), or JJ (127.1 ± 12.6 d), but different from JH (116.5 ± 7.9 d). Services per conception (s/c) were affected by breed ($P < 0.019$). HH had more s/c (2.1 ± 0.1) than JH (1.7 ± 0.1). NEFA were affected by parity ($P < 0.002$), year-season, week, and breed by parity interaction ($P < 0.05$). NEFA were higher in parity 2 (0.50 ± 0.02 mEq/L) than parity 1 (0.43 ± 0.02 mEq/L). NEFA were generally higher in the cold season vs. the hot season, except for yr 3 hot season. NEFA for wk 1 was 0.74 ± 0.02 mEq/L, 0.60 ± 0.02 mEq/L in wk 2, 0.54 ± 0.02 mEq/L in wk 3, 0.50 ± 0.02 mEq/L in wk 4, 0.48 ± 0.02 mEq/L in wk 5, 0.39 ± 0.02 mEq/L in wk 6, 0.36 ± 0.02 mEq/L in wk 7, 0.33 ± 0.02 mEq/L in wk 8, 0.28 ± 0.03 mEq/L in wk 9 and 0.39 ± 0.10 in wk 10. The breed by parity effect showed HH in parity 2 had 0.56 ± 0.03 mEq/L, which was higher than parity 1 (0.44 ± 0.03 mEq/L; $P < 0.0001$). HH parity 2 NEFA was higher ($P < 0.0001$) than HJ parity 1 (0.39 ± 0.03 mEq/L) and JH parity 1 (0.43 ± 0.03 mEq/L; $P < 0.001$) and parity 2 (0.45 ± 0.03 mEq/L). HH parity 2 NEFA was higher than JJ parity 1 (0.45 ± 0.04; $P < 0.02$). HJ parity 1 and 2 were different (0.48 ± 0.03 mEq/L; $P < 0.002$). Even though breed by week interaction was not significant slices analysis revealed differences in wk 1 ($P < 0.03$) and wk 2 ($P < 0.04$). Change in NEFA during the first 2 wk postpartum was most dramatic. Reproductive measures appear more

affected by breed, while week postpartum, season, parity and breed had greater impacts on NEFA.

Key Words: crossbreds, NEFA, reproduction

T332 The effect of feed sorting on intakes of fiber and phosphorus in dairy cows. A. C. Huisman, R. L. Kincaid*, J. J. Michal, K. A. Johnson, and C. T. Gaskins, *Washington State University, Pullman.*

This study examined the impact of diet sorting on intake of NDF and P by lactating cows fed one of 2 TMRs that were fed for 10% refusals. Holstein cows (n = 24; 114 DIM) were fed a control TMR (CTMR; 27.3% alfalfa haylage, 25.4% alfalfa hay, 6.4% whole cottonseed, 36.4% concentrate, and 4.5% dried distillers grains and soluble) or a TMR in which 40% of the alfalfa hay DM was replaced by bluegrass straw (BGSTMR). After 3 wk the diets were switched and cows fed for another 3 wk. Fresh diet was delivered 1X/d with frequent pushups. Feed sorting by pen was assessed by comparing particle size distribution of fresh feed and 24 h refusals for 2 consecutive days for each treatment and period. Actual intakes of NDF and P were determined from the nutrient concentration in each particle size fraction for both fresh diet and refusals. Total fecal P excretion was estimated using ADL values. Analysis of data was performed using PROC GLM of SAS and the model included the effects of treatment, period, and treatment by period. Cows sorted ($P < 0.05$) against the long fraction (23 percentage unit increase in refusals) and for the short fraction (53 percentage unit decrease in refusals) for both treatments. Although sorting occurred, the % NDF in the consumed diet did not differ from the formulated diet (34% vs. 33% for formulated and consumed CTMR, and 36% vs. 35% for formulated and consumed BGS TMR, respectively). Similarly, the % P (0.41%) in the consumed diet did not differ from the formulated diet for either treatment. The feces contained 0.69 and 0.67% P and total fecal P excretion was 75 and 76 g/d, respectively, for the 2 treatments. However, comparison of particle size fractions of fresh feed to 24-h refusals does not consider within day variation of nutrient intake. In summary, feed sorting had no effect on daily intakes of NDF and P of cows fed these alfalfa-based diets.

Key Words: sorting, fiber, phosphorus

T333 Effect of Tasco on core body temperature of dairy cows exposed to heat stress. L. B. Pompeu¹, J. E. Williams*¹, D. E. Spiers¹, R. L. Weaver¹, M. R. Ellersieck¹, K. M. Sargent¹, N. P. Feyerabend¹, H. L. Vellios¹, and F. Evans², ¹*University of Missouri, Columbia*, ²*Acadian Seaplants, Darmouth, Nova Scotia, Canada.*

Previous research in our laboratory revealed Tasco (*Ascophyllum nodosum*) temporarily lowers core body temperature (Tc) in rats and steers fed diets with endophyte-infected tall fescue during heat challenge. The present study determined the impact of Tasco on Tc in dairy cows exposed to elevated ambient temperature (Ta). Holstein cows (n = 32; DIM 107 ± 43; parity 2.7 ± 1.5) were assigned to treatments (trt) using a randomized complete block design, with 8 cows per trt. The study was divided into 3 periods: Period 1 (7 d) was adaptation to the Calan gate system; in Period 2 (28 d) trt were: Control-1 (C-1); Control-2 (C-2); 0.25% Tasco (0.25T); 0.50% Tasco (0.5T); in Period 3 (28 d) C-2 changed to 0.50% Tasco (C-.5T) to evaluate length of feeding Tasco. Each cow had a telemetric temperature transmitter (SmartStock, Pawnee, OK) placed in the reticulum, to record Tc every 20 min. Ta was continuously recorded (Hobo, Onset Computer Corp., Bourne, MA). Daily feed intake and milk production were collected for each cow. For Periods 1, 2 and 3 the average maximum Ta was 29.6, 28.0 and 31.0°C, respectively. In Period 2, no differences ($P > 0.10$) were found between

C-1 and C-2 for any parameter, so they were combined for this period (C). Tasco trt had no effect ($P > 0.10$) on milk production, even with occasionally lower ($P < 0.05$) DMI for 0.25T compared with C and 0.5T. In Periods 2 and 3, there was a trend ($P < 0.10$) for a higher Tc for 0.5T compared with other trt. Linear regression of Tc vs Ta showed that, in Period 2, 0.25T had a slower increase in Tc with the rise in Ta during the day compared with C, while in Period 3, both 0.25T and 0.5T had a slower increase in Tc compared with C-1 and C-.5T ($P < 0.05$). In this same study, for Period 3, 0.25T had a slower increase in rump and ear surface temperature than C-1 and C-.5T as Ta increased. These results revealed that 0.25T maintained lower Tc, rump and ear temperature with increasing Ta.

Key Words: Tasco, heat stress, dairy cows

T334 An update of bulk tank milk quality in California. N. Silva-del-Rio*¹ and C. Collar², ¹*University of California Cooperative Extension, Tulare County*, ²*University of California Cooperative Extension, Kings County.*

Information about bulk tank milk (BTM) quality parameters can be used by dairy producers to compare their milk quality to industry wide benchmarks, and to define achievable goals for their operations. The objective of this study was to describe BTM quality for the California dairy industry. Individual herd information on somatic cell count (SCC), standard plate count (SPC), laboratory pasteurization count (LPC) and coliform count (Coli) from Oct-08 to Sep-09 were provided by a large dairy cooperative in California. All the milk loads shipped by each dairy were sampled weekly (ranging from 1 to 7 loads per week per dairy). Only herds with BTM samples collected throughout the 12 mo period were included in the final data set (n = 537) which comprised a total of 56,455 BTM observations. BTM samples below the regulatory threshold set by the California Department of Food and Agriculture (CDFA) were: 99.4% for SCC (<600,000 cell/mL), 96.5% for SPC (<50,000 CFU), 96.1% for LPC (<750 CFU/mL), and 93.0% for Coli (<750 CFU/mL). BTM quality parameters were described with Proc Univariate of SAS. Season effects (S1 = Jan-Mar, S2 = Apr-Jun, S3 = Jul-Sep, S4 = Oct-Dec) of log-transformed data were evaluated using Proc Mixed of SAS with repeated measurements on herd. Description of BTM quality parameters for the top 25% herds, the bottom 25% herds and the median counts are presented in Table 1. There was a significant effect of season on each of the BTM quality parameters ($P < 0.001$). SCC were lower in S2 than S1-S3-S4. SPC were higher for S1 than S2-S3-S4. However, SPC and Coli were higher in S1-S4 than in S2-S3. Overall, during the study period, California BTM quality was within acceptable parameters.

Table 1. SCC, SPC, LPC and Coli counts in California BTM, top 25% herds, bottom 25% herds and median counts from Oct-08 to Sep-09

	SCC (cell/mL)	SPC (CFU/mL)	LPC (CFU/mL)	Coli (CFU/mL)
25% top herds	<156,698	<2,969	<43	<25
25% bottom herds	>252,679	>5,729	>129	>63
Median	202,208	3,534	74	39

Key Words: bulk tank milk quality, dairy, California

T335 Determination of variation in dairy cows response to heat stress using radiotelemetry. L. B. Pompeu, J. E. Williams, D. E.

Spiers*, R. L. Weaver, and M. R. Ellersieck, *University of Missouri, Columbia*.

Summer heat is a major problem for dairy cattle, which have an elevated body heat production. At air temperature (T_a) above thermoneutrality, reduction in feed intake and milk production occur along with increased core body temperature (T_c). However, individual animals vary in response to heat stress, which can provide large variance between groups. To evaluate different levels of animal response to heat stress, a study was performed utilizing 15 Holstein cows, housed in a free-stall barn, during June and July (2008). A telemetric temperature transmitter (SmartStock, Pawnee, OK) was placed in the reticulum of each cow to record T_c . T_a was recorded using Hobo loggers (Onset, Bourne, MA). Feed intake and milk production were collected daily. A period of progressively increasing heat stress (9 d) was chosen to be analyzed (max T_a : 29.7°C, min T_a : 20.7°C). T_c and milk production relationships to T_a were assessed by quadratic and linear regressions, respectively, to separate cows into sensitive (S; $n = 5$) and non-sensitive (NS; $n = 5$) groups based on R^2 . Five cows showed an intermediate response and were removed from analysis. For the analysis, hours 1000 to 1500 were used to assess the major rise in T_c during the day. A 1-h lag in T_c and 1-d lag for milk production were utilized for better correlation with T_a . Linear regression of T_c vs. T_a showed a difference between regression coefficients and slopes of S ($R^2 = 0.68$; slope = 0.12) and NS ($R^2 = 0.54$; slope = 0.08). Daily max, min, and mean T_a were tested against milk production, with min T_a yielding the best correlation. Milk production also showed a large difference with the linear fit and slope of S ($R^2 = 0.75$; slope = -0.71) being larger than NS ($R^2 = 0.27$; slope = -0.25). The greater slopes of sensitive animals indicate a larger response to T_a compared with non-sensitive animals, indicating variations in responses between animals among the same group of cows. Thus, to evaluate heat strain, it is essential to analyze animals separately by their level of response.

Key Words: heat stress, dairy cow, core temperature

T336 Corn silage management practices on California dairies. N. Silva-del-Río*¹, J. M. Heguy², and A. Lago³, ¹*University of California Cooperative Extension, Tulare County*, ²*University of California Cooperative Extension, Stanislaus and San Joaquin Counties*, ³*APC Inc., Ankeny, IA*.

The aim of this study was to obtain information on current corn silage feed management practices in California's Central Valley. In summer 2009, a feed management survey was mailed to dairy producers in Tulare, Stanislaus, and San Joaquin; the first, third and seventh largest dairy counties in California, respectively. Producers received an envelope containing an invitation letter to participate in the study, a one-page survey, and a pre-paid return envelope. Response rate was 16.9% (120/710). Herd size ranged from 160 to 6,600 cows (median = 950). Corn silage in California was more frequently stored in piles (85.0%) and on concrete (75.0%), versus bunkers or dirt. Dairies reported top surface spoiled forage: <7.5 cm (25%), 7.5 to <15 cm (53.9%), 15 to <23 cm (15.7%), ≥ 23 cm (4.9%). Only one producer indicated that silage was not covered. A total of 54.7% ($n = 55$) of dairies covered silage with oxygen barrier (OB) technology. Top surface spoiled forage was reported to be < 15 cm in 89.3% of silages covered with OB technology and in 64.0% of silages covered with conventional plastic material. Bacterial inoculants of various types were used in 54.0% of corn silages. Most respondents (73.4%) considered that silage faces were maintained smooth, but only 5 producers used face shavers. The entire width of the silage face was removed daily in 41.7% of dairies, and of those, 27% removed less than 15 cm depth per day. Of dairies that did not remove the entire width of the silage face (1/2 face-24.0%, 1/3 face-26.9%, 1/4 face -7.4%), 15.0% advanced less than 15 cm depth per day. Determination of silage dry matter (DM) was conducted at least once a month in 52.3% of dairies. Only 8.3% of dairies determined DM weekly, or more often. Most dairies delegated DM determination to an outside nutrition consultant (86.6%). A total of 25.0% of dairies suspected mycotoxins in 2008. Top surface spoiled forage was discarded by 70.4% of dairies suspecting mycotoxins, and by 55.8% of those that did not suspect mycotoxins. Although dairy owner and manager responses are subjective, results indicate areas where corn silage management can be improved, such as removal rate, surface spoilage, and pile size.

Key Words: corn silage, dairy, survey