

Production, Management and the Environment: Dairy Production

M263 Effect of a rumen-protected niacin product on lactation performance by dairy cows during summer in Wisconsin. K. Yuan*, R. Shaver, M. Espineira, and S. Bertics, *Department of Dairy Science, University of Wisconsin-Madison, Madison.*

Research suggests that supplemental dietary niacin may improve the ability of lactating dairy cows for coping with heat stress. However, niacin is extensively degraded in the rumen. With advances in vitamin encapsulation technology, a niacin product, NiaShure, was developed to protect niacin from rumen degradation (Balchem Corp., New Hampton, NY). The objective of this study was to evaluate the effect of this rumen-protected niacin product on lactation performance by dairy cows during the summer in Wisconsin. Eighty lactating cows (63 ± 29 DIM) were used in a 10-wk lactation trial (a 2-wk pretreatment covariate period followed by an 8-wk treatment period). Cows were stratified by breed, parity and DIM, and randomly assigned to 10 pens of 8 cows each. Pens were assigned randomly either to control (C) or 12 g/d per cow rumen-protected niacin (RPN) TMR group. Ambient temperature and humidity were monitored weekly to calculate temperature-humidity index (THI) and individual cow rectal temperatures were measured weekly, to characterize heat stress conditions during the experiment. Data were analyzed as a completely randomized design with a covariate using SAS Proc Mixed. Milk yield (48.6 vs. 48.4 kg/d), milk fat percent (3.41 vs. 3.35%), milk protein percent (2.90 vs. 2.92%), milk fat yield (1.66 vs. 1.62 kg/d), milk protein yield (1.41 vs. 1.41 kg/d), milk lactose percent (4.89 vs. 4.87%), dry matter intake (27.2 vs. 27.3 kg/d), body weight (714 vs. 717 kg), body condition score (2.81 vs. 2.78) and rectal temperature (38.4 vs. 38.4°C) were not different ($P > 0.05$) between RPN and C. In summary, under summer conditions in Wisconsin, dietary supplementation with 12g/d per cow RPN did not affect lactation performance or body temperature of dairy cows.

Key words: dairy cow, heat stress, rumen-protected niacin

M264 Body condition score at calving affected milk yield and blood metabolites in Holstein dairy cows. Y. Moharrami¹, G. R. Ghorbani¹, H. R. Rahmani¹, S. M. Nasrollahi¹, and C. Li*², *¹Department of Animal Sciences, Isfahan University of Technology, Isfahan, Iran, ²Agriculture and Agri-Food Canada, Research Centre, Lethbridge, AB, Canada.*

A study was conducted to evaluate the effect of body condition score (BCS) on milk yield and blood metabolites in Holstein dairy cows. Three hundred and 12 multiparous Holstein dairy cows from 2 commercial dairy farms were scored for body condition beginning at one month before dry-off. Cows were scored monthly before calving and bi-weekly after calving until 120 DIM. Body condition score were assigned by 2 independent individuals ranging from 1 (thin) to 5 (obese) using the visual technique. The experiment was designed as a 2×2 factorial arrangement of treatment included farm (1 and 2), and BCS (<3.5; low and ≥ 3.5 ; high). Milk yield and fat were recorded for individual cows. Plasma glucose, insulin, leptin, triglyceride, NEFA and BHBA were determined a week before and a week after parturition. Data were analyzed using the PROC MIXED in SAS. The effects of farm, BCS and the interaction were considered as fixed effects and cow was considered as random effect in the model. There were no interactions between farm and BCS, and no differences were observed between the 2 farms on milk production and blood metabolites. Cows calving with high BCS produced more milk (high vs. low BCS; 41.3 vs. 40.0 kg/d; $P < 0.07$) with higher milk fat content (high vs. low

BCS; 3.43 vs. 3.18%; $P < 0.01$); consequently produced more 4%FCM (high vs. low BCS; 37.6 vs. 35.5 kg/d; $P < 0.01$) compared with the low BCS group. Plasma glucose was higher (high vs. low BCS; 59 vs. 55 mg/dl; $P < 0.03$) but other blood metabolites were not different between the low and high BCS groups. The results indicated that managing adequate BCS during the dry period or early lactation improved milk production and milk fat content. Calving with BCS ≥ 3.5 may be suitable for more milk fat production.

Key words: BCS, milk yield and milk fat content, dairy cows

M265 Body condition score at calving affected reproductive performance and metabolic disorders in Holstein dairy cows. Y. Moharrami¹, G. Ghorbani¹, H. Rahmani¹, S. M. Nasrollahi¹, and C. Li*², *¹Department of Animal Sciences, Isfahan University of Technology, Isfahan, Iran, ²Agriculture and Agri-Food Canada, Research Centre, Lethbridge, AB, Canada.*

A study was conducted to investigate whether body condition score (BCS) at calving affect reproduction performance and metabolic disorders in high producing dairy cows. Three hundred and 12 multiparous Holstein dairy cows from 2 commercial dairy farms were used. The experiment was designed as a 2×2 factorial arrangement of treatment included farm (1 and 2), and BCS (<3.5; low and ≥ 3.5 ; high). Reproduction performance including conception at first service, days from calving to first insemination, open days, services per conception and conception rate were recorded. Metabolic disorders including dystocia, retained placenta, LDA, laminitis and mastitis were recorded within 120 DIM. Metabolic disorder and conception data were analyzed using the GENMOD procedure of SAS. Other data were analyzed using the mixed model procedure of SAS to account for farm, BCS and the interaction as fixed effects and cows as random effect. There were no interactions between farm and BCS, and no differences were observed between the 2 farms. Days from calving to the first insemination was reduced ($P < 0.02$) by 7 d with high versus low BCS. Similarly, cows with high BCS at calving had less ($P < 0.05$) open days (90 d) compared with low BCS (103 d). Conception at first service, services per conception and conception rate were not different between high and low BCS groups. BCS of 3.5 or higher at calving were associated with an increased (56%; $P < 0.02$) risk for laminitis which could be due to heavier BW on the legs. Incidence of dystocia, retained placenta, LDA and mastitis were not different between the low and high BCS groups. Results suggest that the adequate BCS may reduce interval between calving and first insemination and open days, but had limited influence on metabolic disorders. The calving BCS at 3.5 point or slightly higher may be suitable for transition period management.

Key words: BCS, reproduction performance, dairy cows

M266 Effects of bovine somatotropin (rbST) at 250 mg or 500 mg administered to crossbred cows (*Bos taurus* x *Bos indicus*). B. G. Campos*^{1,2}, S. G. Coelho¹, A. M. Q. Lana¹, E. Rabelo³, E. A. Alvarenga¹, and B. F. Silper¹, *¹Escola de Veterinária da Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brasil, ²Fundação de Amparo à Pesquisa do Estado de Minas Gerais, Belo Horizonte, Minas Gerais, Brasil, ³Recursos Humanos no Agronegócio, Belo Horizonte, Minas Gerais, Brasil.*

Numerous studies been conducted to determine the effects of rbST in *Bos taurus* dairy cows, however, there are a few studies evaluating the rbST response in crossbred cows (*Bos taurus* × *Bos indicus*). Since the Brazilian herd is compound mostly by crossbred cows (*Bos taurus* × *Bos indicus*), the objective of this study was to evaluate the effects of the 250 or 500 mg rbST on milk production and milk composition, body weight and body condition score of crossbred cows of 3/4 and 7/8 (*Bos taurus* × *Bos indicus*). The 57 animals were assigned to 3 treatments: T0- control (7 primiparous and 12 multiparous), without administration of rbST; T250- 250 mg rbST (5 primiparous and 12 multiparous and T500- 500 mg rrbST (21 cows (8 primiparous and 13 multiparous). Cows received 16 consecutive rbST injections of 500 mg or 250 mg, respectively (BOOSTIN 500 mg or HILAC-250 250 mg - Schering-Plough/Intervet), starting at 63+3.5 d of lactation, administered at 14-d intervals. Milk production was measured twice weekly and milk composition every 15 d; BW and body condition scores were evaluated monthly. All animals were under the same nutritional management with confinement in the winter and rotational grazing in the summer and milked twice daily. The study was conducted as a completely randomized design. To test differences between means of milk yield, milk composition and body weight, the Dunnett test ($P < 0.05$) was used. Regression analysis was used for the evaluation times. For the analysis of body condition scores the Friedman and Kruskal-Wallis test ($P < 0.05$) were used for groups and days evaluation respectively. Milk production was higher for T500 (21.8 ± 7.0 kg/day) compared with T0 (20.0 ± 5.8 kg/day) and T250 (19.2 ± 7.1 kg/day) treatment ($P < 0.05$). All treatments had the same rate of decrease in production of 0.043 kg milk / day ($P > 0.05$). There were no differences between treatments for milk composition, body weight and body condition scores at different times evaluated ($P > 0.05$). Research supported by FAPEMIG - APQ 01005/08.

Key words: crossbred, milk composition, milk production

M267 Effect of pen change on daily milk yield of dairy cows. A. Zwald* and R. D. Shaver, *University of Wisconsin-Madison, Madison.*

The objective of this experiment was to determine the effect of pen change on daily milk yield by dairy cows over the first 10 d after changing pens in a commercial setting. The study was conducted during fall of 2010 in a 4,000 cow Jersey and Holstein x Jersey crossbred herd. Study cows were stratified by parity (multi- or primiparous). Two pens of 420 animals under the same management were evaluated. Animals were either Jerseys or Holstein x Jersey crossbreds. Pens were stocked at 100 percent. Animals were evaluated by days in milk (DIM) and cows between 65 and 170 DIM were eligible for enrollment. Ten percent of the pen was enrolled to the non-move (NM) group and 10 percent of the pen was enrolled to the move (M) group. The day of the move, the 42 animals enrolled to the M group in pen one switched places with the M group of pen 2. New cows were enrolled and this procedure was repeated once, 4 weeks after the initial move. Weights were taken from each milking in the parlor from the Boumatic meter system and downloaded to DairyComp 305. If a milking was missing, the weekly average weight was used. Animals were removed from the trial if more than 5 full days on either side of the move were missing. Data were analyzed using Proc Mixed of SAS with starting pen, parity, treatment, day, and treatment*day interaction as fixed effects and cow within treatment as a random effect. The least squares means for the average daily milk yield for the NM group were 32.5, 31.5, 32.3 kg/cow for the 5 d prior, day of, and 5 d after pen change, respectively. Least squares means for average daily milk yield for the M group were 32.0, 31.3, and 32.0 kg/cow for the same time periods. The least

squares means for average daily milk yield for the 5 d before and 5 d after regrouping were not different ($P > 0.10$). The least squares means for the M and the NM groups were not different ($P > 0.10$) during any period. Changing pens with large groups of animals does not appear to have a detrimental effect on production.

Key words: grouping, milk yield, dairy cow

M268 Milking management of crossbred Holstein x Gyr (F1) cows without calf on production performance. L. H. Oliveira¹, J. M. S. Filho¹, F. L. B. Toral¹, and R. B. Reis^{*1,2}, ¹Federal University of Minas Gerais (UFMG), Belo Horizonte, Minas Gerais, Brazil, ²FAPEMIG, Belo Horizonte, Minas Gerais, Brazil.

Crossbred Holstein (*Bos taurus*) × Gyr (*Bos indicus*) cows for milk and calf production is very popular in Brazil because production and adaptation in tropical conditions. However, these animals have strong link with their offspring turning them susceptible to lactation failure if milked in absence of their calf. Exogenous oxytocin injection has been used to stimulate milk ejection without calf presence during the milking. The objective of this research was to compare the effect of exogenous oxytocin injection or calf presence during milking on milk production and composition, lactation persistency of crossbred Holstein × Gyr (F1) cows. Seventy 4 multiparous cows were randomly assigned to 1 of 2 experimental groups. Group (BP) cows were milked in the presence of their calf and suckled post-milking for 30 min ($n = 36$). The cows in group (OT) were milked in the absence of the calf and injected in the mammary vein with 2.0 IU of oxytocin (Postipofisin, Hertape Calier), immediately before milking ($n = 38$). Cows were weekly checked for milk yield and milk samples were collected for milk composition and Somatic Cell Count (SCC). The adjustment of the lactation curve was performed using incomplete gamma function proposed by Wood (1967) and the parameters of each function estimated by the NLIN procedure of SAS. Accumulated milk yield at 30, 60, 90 120 and 150 d, initial milk yield, milk production at peak, protein, lactose, total solids % and SCC did not differ between groups ($P > 0.05$). The group OT did not have the milk production reduced due to absence of their calf. The peak of lactation occurred at 24.3 DIM. Group OT had a higher lactation persistency ($K = 0.00383$ vs. $K = 0.00480$; $P = 0,01$) and higher fat content at 90 DIM ($2.40+0.35$ vs. $3.77+0.19$; $P < 0.05$) and 120 DIM ($2.78+0.27$ vs. $3.45+0.17$; $P < 0.05$). The cows receiving oxytocin injection showed better performance, indicating that this practice is a valuable management tool for milking Holstein × Gyr F1 cows in the absence of calf.

Key words: oxytocin, milk production, crossbred cows

M269 Risk management practices by Idaho dairy producers. R. J. Norell*¹, C. W. Gray², and M. Chahine², ¹University of Idaho, Idaho Falls, ²University of Idaho, Twin Falls.

A mail-in survey was conducted to evaluate risk management strategies and practices on Idaho dairies. The survey was mailed to every dairy producer registered in the state of Idaho ($n = 489$) and 140 surveys were returned (28.6% response rate). Survey data were compared with Proc GLM and Proc Freq in SAS (SAS Inst. Inc., Cary, NC). Dairies were categorized as small ($n < 250$ cows, 45.7%), medium ($n = 250$ to 749 cows, 25.7%) or large ($n > 749$ cows, 28.5%). Eighty percent of dairies have utilized one or more risk management strategies with 41 ± 4% using 1 to 3 strategies and 39 ± 4% using 4 or more. Large dairies utilized more strategies at a higher frequency of use ($P < 0.0001$) than small dairies with medium dairies intermediate.

Overall use of risk management practices were: feed contracts (70 ± 4%), milk contracts (63 ± 4%), hedge milk (42 ± 4%), hedge corn (38 ± 4%), hedge soybean meal (27 ± 4%), put options (26 ± 4%), put + call options (22 ± 4%) and Livestock Gross Margin (12 ± 3%). Eighty 2 percent have a current lender and 36 ± 5% are encouraged by their lender to use risk management strategies. Producers utilized on average 4.7 ± 0.2 sources of market information and the number of sources did not differ between herd size groups ($P > 0.25$). Market information sources included: Chicago Mercantile Exchange (87 ± 3%), magazines (86 ± 3%), processors (81 ± 3%), extension newsletters (67 ± 4%), commercial newsletters (64 ± 4%), newspaper (53 ± 4%), and broker (35 ± 4%). Respondents were interested in 4 educational programs: how to hedge (70 ± 4%), how to use options (71 ± 4%), how to protect dairy margins (80 ± 3%), and Dairy Livestock Gross Margin program (76 ± 4%). Small operations were less interested in hedging and options education than large and medium operations ($P < 0.05$). Producers preferred educational training methods in the following order: producer meetings (80 ± 3%), one on one (66 ± 4%), newsletters (56 ± 4%), magazine articles (48 ± 4%), web based materials (46 ± 4%), and webinars (29 ± 4%). Preference for educational method did not differ between herd size categories ($P > 0.25$). We conclude that risk management strategies are an important management tool for Idaho dairy producers and further risk management training is desired by the industry.

Key words: risk management, educational methods

M270 High diurnal fluctuations of ambient temperature do not improve the adaptation of dairy cows to heat stress. H. Khelil^{1,2}, P. Faverdin^{1,2}, and A. Boudon^{*1,2}, ¹INRA, UMR1080 Production du Lait, Saint-Gilles, France, ²Agrocampus Ouest, UMR1080 Production du Lait, Rennes, France.

Climate change should increase the frequency of heat stress periods in temperate conditions. This study was designed to compare the effects of 2 types of heat stress (constant or variable within day) to thermoneutral conditions, on 8 cows either in early (73 d in milk) or mid (155 d in milk) lactation. The patterns of ambient temperature were a constant temperature of 18.0°C (thermoneutrality, TN), a constant temperature of 29.0°C (High Temperature Constant, HTConst), a variable temperature of 32.2°C between 6:00 and 17:00 and 21.5°C between 18:00 and 4:00 with a daily average of 28.4°C (High Temperature Variable, HTVar). Patterns were compared according to a crossover design, with 2 climatic rooms containing each, 2 early and 2 mid lactation cows during 3 periods of 15 d. Recovery periods of 15 d at a constant temperature of 18°C were included between measurement periods. Daily average of temperature-humidity index (THI) was 63 for TN, 75 for HTConst and 76 for HTVar with THI exceeding 78 between 6:00 and 17:00. Between 6:00 and 17:00, cows increased their respiration rate from 29.0 respirations/s at TN to 53.5 at HTConst and 66.5 at HTVar ($P < 0.001$) and their vaginal temperature from 38.5°C at TN to 39.2°C at HTConst and 39.5°C at HTVar ($P < 0.001$). Daily average of vaginal temperature increased from 38.6 to 39.3°C from TN to HT ($P < 0.001$) with no differences between HTConst and HTVar. Dry matter intake decreased from 21.8 kg at TN to 18.4 kg at HT ($P < 0.01$). Daily milk yield averaged 28.6 kg and was not significantly affected by the temperature pattern even though morning milk yield decreased from 18.7 kg at TN to 16.3 kg at HT ($P < 0.05$). Milk fat and protein contents decreased from 42.2 and 30.5 g/kg respectively at TN to 40.0 and 28.7 g/kg at HT ($P < 0.001$) with no significant differences between HTConst and HTVar. Proportion of eating time between 6:00 and 17:00 decreased at HTVar compared with TN and HT Const (0.41

vs. 0.55, $P < 0.001$). In conclusion, high diurnal fluctuations of ambient temperature did not improve cow performance compared with a constant temperature with a similar daily average.

Key words: heat stress, temperature-humidity index, dairy cow

M271 Assessment of long-term nitrogen runoff reduction from dairy pastures. R. White* and J. L. Capper, *Washington State University, Pullman.*

A 20-yr assessment was run simulating a pasture on a dairy to determine the effect of various harvesting techniques on Nitrogen (N) removal from the system. The aim was to identify a treatment that resulted in the greatest uptake of N by plant matter thereby diminishing N loss through runoff. Grass, shrubs and trees were modeled to function as they would in a riparian system, grass diffused water to allow absorption by soil, whereas shrubs and trees functioned to absorb nutrients. The pasture was located next to a dairy from which runoff inputs were given as N, Carbon and water sources. Other inputs to the system were historical data for monthly rainfall, temperature and soil attributes. The output was expressed as N runoff from the soil profile. The model was run over 20 yrs to view the long-term consequences of treatments. Mowing, grazing and planting were hypothesized to stimulate a grass density increase inhibiting water flow from the system while pruning and burning plants were thought to stimulate growth and increase nutrient uptake from the soil. These hypotheses were tested via 5 treatments: mowing grass to a stubble height of 0.1 m², pruning 1 m² from trees and 0.5 m² from shrubs, planting 90 kg of grass/acre, grazing of 450 kg of cattle/acre, and burning 70% of the biomass. A total of 4.335 kg N per acre was calculated to runoff during the 20-yr time period. Annual planting in October, burning before yr 5 and pruning after yr 3 were all found to significantly decrease N runoff. When grazing during the spring N runoff increased to 5.16 kg; however, during the winter, runoff did not significantly increase. Mowing did not change N runoff. The most effective reduction resulted from annual fires in the first 5 yrs, pruning annually in August starting in yr 7, grazing cattle annually starting in yr 6 and annual planting of grass in October. This combination of treatments resulted in a runoff reduction to 1.09 kg N, nearly a 75% decrease. This reduction shows that good riparian area management, including use by cattle, can reduce N runoff from dairy pastures.

Key words: nitrogen, runoff, dairy

M272 Milk, fat, and protein production in relationship to herd linear somatic cell score in Minnesota. R. F. Leuer* and J. K. Reneau, *University of Minnesota, St. Paul.*

The impact of herd average udder health on production is significant. It has long been recognized that herds with low somatic cell counts also excel in other aspects of herd management that contribute to overall herd productivity. Linear somatic cell score (LSCS) has been shown to be highly related to milk and other yield characteristics of individuals within a herd. The objective of this study was to evaluate the relationship between herd test day average LSCS and rolling herd average milk production (RHAM), rolling herd average fat production (RHAF), and rolling herd average protein production (RHAP). Minnesota DHIA monthly average herd records were collected from January 2007 to November 2010. Monthly tests with fewer than 30 cows and without SCC, milk, fat, and protein information were removed. Herds averaging less than 10 tests per year over the collection period were also removed. Monthly records (n = 62,582) were analyzed using PROC REG. The equation for rolling herd averages are: RHAM =

12,449.5 Kg – 916*LSCS, RHAF = 419 Kg – 28.8*LSCS, RHAP = 372.7 Kg – 24.9*LSCS. The R2 for the regressions were RHAM = 0.13, RHAF = 0.11, RHAP = 0.11. Herds with a lower LSCS produced a greater volume of milk, fat, and protein. Herd linear somatic cell score gives insight to overall management level and production ability.

Key words: linear somatic cell score, milk quality

M273 Effects of water total dissolved solids on milk-fed calves weight gain, feed intake and weaning age in winter. R. Ramezankhani¹, A. Alizadeh¹, A. Nasserian², M. Chehrizi³, and B. Saremi⁴, ¹Department of Animal Science, Islamic Azad University, Saveh Branch, Saveh, Iran, ²Department of Animal Science (Excellent Center of Animal Nutrition), Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad, Iran, ³Epidemiology and Reproductive Health Department, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran, ⁴Institute of Animal Science, Physiology and Hygiene unit, University of Bonn, Bonn, Germany.

In some areas of Iran dairy farms use drinking water that containing elevated total dissolved solids (TDS). Reliable information concerning water TDS on calves' performance is limited, especially in winter. The aim of this study was to compare 3 water TDS groups; High TDS (HTDS) ≈3000 ppm, Medium (MTDS) ≈1100 ppm and Low (LTDS) ≈160 ppm used as calf drinking water. Holstein calves (n = 21) were randomly assigned to 3 groups in a commercial dairy farm (Laban, Qom, Iran) during winter. Calves were subjected to different treatments from 3 d after birth up to 30 ± 2 d old (0.5 L per day). Thereafter, ad libitum access to drinking treatments was available until weaning. Dairy calves were weaned after they reached 1kg starter intake for 3 consecutive days. Data were analyzed by SPSS 17. Mean ambient temperature during the experiment was 12°C. Calves in the HTDS group had highest water consumption (Table 1), although this group had the lowest starter intake. Body weight of calves for the MTDS group was highest on d 60. Weaning weight did not differ among treatments. Weaning day was affected by water TDS and calves in the MTDS group weaned earlier than HTDS. Urine pH decreased linearly as TDS increased. Body temperature, height, and body length were similar among treatments. This study indicated that water TDS can increase feed intake with a reduction in water intake. Decreased milk feeding period was a consequence of increased feed intake. TDS values at 160ppm are recommended in winter.

Table 1. Performance, feed and water consumption and urine pH of dairy calves receiving several water TDS contents

| Item | LTDS | MTDS | HTDS | SE |
|-------------------------|--------------------|--------------------|-------------------|-------|
| Water consumption (L/d) | 1.95 ^b | 2.05 ^{ab} | 2.24 ^a | 0.19 |
| Feed intake(g/d) | 540 ^a | 545 ^a | 525 ^b | 7.6 |
| Body weight- 60 d (kg) | 63.7 ^b | 65.6 ^a | 61.7 ^b | 1.24 |
| Weaning day(d) | 69.8 ^{ab} | 68.7 ^b | 73.7 ^a | 0.9 |
| Urine pH | 6.55 ^a | 6.52 ^b | 6.49 ^c | 0.006 |

^{a-c}Values with differing letters within the same row are significantly different ($P < 0.05$).

Key words: water total dissolved solids, calf, winter

M274 Occurrence of milk unstable protein in dairy farms from southeastern region of Brazil. L. C. Roma Junior^{*1}, A. C. O. Rodrigues², T. G. R. Amaral², F. Cardoso^{2,3}, and P. F. Machado²,

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Milk quality is important to achieve good dairy industrialized products. The stability of milk protein is one of the most important factors. During the industrialization process thermal treatment (heat) is applied to milk. Milk characterized as unstable protein (UP) is affected by thermal treatment and has negative impacts on dairy farmers, industry and consumers. UP is defined as low casein stability resulting in precipitation during the alcohol test without the presence of acidity on milk. The present study had the objective of evaluating the quality of milk protein regarding its thermal stability in the Brazilian Southeastern Region. This evaluation was carried through by quantification of the problem of UP and the analysis of the factors related to the occurrence. During the years 2005/2006, 2,970 bulk tank milk samples from individual farms were processed. In this period, samples were classified by identifying and quantifying the UP occurrence. Finally, the characteristics of both the facilities and factors which would affect the occurrence of the problem were verified. As a result, 7% of the total volume of produced milk, throughout one year, showed the UP problem, without any kind of geographic influence. However the season of the year had an influence on this occurrence ($P < 0.05$), being identified the beginning of the Autumn and the end of the Winter as the periods with higher numbers of occurrence. Reduction of lactose level ($P < 0.05$) was present in samples with UP that also presented a reduction of its the thermal stability, without presenting any kinds of raised acidity. This problem was related to animals, which were in advanced periods of lactation or presented a reduction of their corporal score due to the low consumption of dry matter, specifically for diets with low energy levels, resulting in the reduction of lactose in milk.

Key words: milk quality, thermal stability, dairy nutrition

M275 Alternative cooling of dairy cows by wetting the udder. J. A. Binversie^{*1}, J. D. Davis¹, K. G. Gebremedhin², C. N. Lee³, and J. E. Larson¹, ¹Mississippi State University, Mississippi State, ²Cornell University, Ithaca, NY, ³University of Hawaii, Honolulu.

Heat stress is a major inhibitor of production in livestock operations, causing severe economic loss. The objective of this study was to determine whether spraying the udder with water, with or without fans blowing air onto the udder, cools the body as effectively as spraying water on the back of the animal with or without fans blowing air on the back. Twelve pregnant, lactating Holstein cows were used over 4 d with 4 applications of each treatment each d. Treatments included wetting of the back with a fan (B+F, n = 24), and without a fan (B+NF, n = 72) blowing air on the back; wetting of the udder, with a fan (U+F, n = 24) or without a fan (U+NF, n = 72) blowing air on the udder. The back or udder of each animal was sprayed with water for 1 min, and in appropriate treatment groups, air from identical fans was blown on the wetted area for the duration of the treatment and measurement time periods. Rectal temperature, respiration rate, and surface skin temperature of the back and udder were collected 10 min after treatment application. Data were analyzed using the Mixed Procedure of SAS with the replication during each day analyzed as a repeated measurement and Black globe humidity index (BGHI) used as a covariate. Mean BGHI and Temperature Humidity Index for the period were 80.3 ± 0.3 and 81 ± 0.3, respectively. Rectal temperatures and respiration rates were not different ($P > 0.05$) among treatments. The LSMs and SEM of rectal temperatures were 39.8 ± 0.1, 39.6 ± 0.2, 39.6 ± 0.1, and 39.6 ± 0.2°C and the respiration rates were 110.6 ± 1.6, 106.1 ± 2.9, 109.0

± 2.9 and 109.0 ± 1.6 breaths/min for cows treated with B+NF, B+F, U+NF, and U+F treatments, respectively. Skin surface temperatures of the back were similar among treatments. Interestingly, cows that received B+F had a cooler udder surface temperature ($38.1 \pm 0.3^\circ\text{C}$; $P \geq 0.05$) compared with all other treatments: 38.5 ± 0.2 , 38.7 ± 0.3 , and $38.5 \pm 0.2^\circ\text{C}$ for cows receiving U+NF, U+F, and B+NF, respectively. In conclusion, efforts to abate heat stress by spraying the udder with water either with or without a fan is as effective as spraying the back with water.

Key words: dairy cows, heat stress, wetting

M276 Effect of essential oils on production and reproduction in early lactating cows during heat exposure. U. Serbester¹, M. Çmar¹, A. Ceyhan¹, H. Erdem², M. Görgülü³, H. R. Kutlu³, L. Baykal Çelik³, Ö. Yücelt⁴, P. W. Cardozo*⁵, and M. Blanch⁵, ¹*Bor Vocational School, University of Nigde, Turkiye*, ²*Department of Obstetrics and Gynecology, Faculty of Veterinary Medicine, University of Selçuk, Turkiye*, ³*Department of Animal Science, Faculty of Agricultural, University of Cukurova, Turkiye*, ⁴*Ekol Company, Turkiye*, ⁵*Novus International Inc., St. Charles, MO*.

Twenty-five Holstein cows (8 primiparous and 17 multiparous, DIM 37.4 ± 3.1 d; milk yield 29.8 ± 1.23 kg/d) were used for 78 d to evaluate the effect of essential oil compound mixture (EOCM; containing cinnamaldehyde and diallyl disulfide; Novus International, Inc.) on productive performance and pregnancy rate during heat exposure. The early lactation dairy cows were subjected to presynch-ovsynch protocol 12 d apart and inseminated to timed AI (TAI). Cows were individually fed a total mixed ration comprising (DM basis) 60% concentrate and 40% silage of common vetch with triticale. The concentrate differed only in the addition of EOCM as 25 mg/kg concentrate (as fed). Ambient temperature and relative humidity were recorded, and temperature-humidity index (THI) was calculated throughout the study. Dry matter intake, milk production were measured daily, milk samples were taken twice a week, blood samples were collected weekly, and ultrasonography was performed at 29 and 42 d post-TAI to determine conception rate. Results were analyzed using PROC MIXED for repeated measures and conception rates were analyzed utilizing GENMOD procedure of SAS. Differences were declared at $P < 0.05$. Average of ambient temperature, relative humidity and THI were 25.9°C , 73.4% and 76.8%, respectively. Even with addition of EOCM, body weight, DMI, milk yield, milk composition, serum glucose, IGF-I, progesterone concentrations and conception rate were not affected ($P > 0.05$); however, EOCM supplementation increased ($P < 0.01$) insulin concentration, and tended to decrease ($P = 0.07$) serum total cholesterol concentrations, and increase ($P = 0.10$) NEFA concentrations. Results indicate that at the level offered, EOCM did not affect milk production and conception rate of early lactating dairy cows during heat stress. The increase of insulin and reduction of total cholesterol observed in EOCM group needs to be confirmed with further research.

Key words: essential oils, dairy cows, conception rate

M277 The relationship between milk urea nitrogen with milk yield and protein percentage categories for Iranian Holstein cows. F. Fatehi*¹, M. Honarvar², M. Dehghan-Banadaky¹, A. Zali¹, and A. Young³, ¹*Department of Animal Science, Campus of Agriculture and Natural Resource, University of Tehran, Karaj, Iran*, ²*Islamic Azad*

University, Shahriar, Shahr_e_Qods Branch, Shahriar, Iran, ³*Department of Animal, Dairy, and Veterinary Sciences, Utah State, Logan*.

Considerable interest has developed in using MUN as a monitor of the efficiency of nitrogen utilization by dairy cows. However, the association between MUN and both nutritional management and performance should be determined under field conditions using commercial testing procedures. To investigate these associations, a measure of the Production Variables factors affecting MUN is needed. The objectives of this study were to determine the relationships among MUN, milk yield, and milk protein in Iranian Holstein cows. Milk production was grouped by increments of 9.1 kg/d with the upper grouping of 63.6 kg and greater for Holstein cows. Also for milk protein the categories were less than 3.0%, 3.01 to 3.2%, and $>3.2\%$ milk protein. Multivariate mixed linear regression models using the Proc Mixed procedure in SAS (SAS, 2004) was used to determine the association between MUN (dependent variable) and milk yield and protein categories (independent variables). Multiple comparisons were made with P-values adjusted using Tukeys procedure. In Iranian Holstein cows, MUN was lower when milk protein was $>3.2\%$ (vs. $<3.0\%$ or 3.01 to 3.2%). Also, MUN was lower for cows with milk protein 3.01 to 3.2% than the group of $<3.0\%$ milk protein for all milk yields (Table 1). Because of these relationships, milk protein percentage should be considered in addition to MUN concentration as a management tool to determine if rations are properly balanced.

Table 1. Least squares means and SE of MUN concentration by milk yield and protein percentage categories for Iranian Holstein cows

| Milk Category, kg | $\leq 3.0\%$ | | 3.01-3.2% | | $> 3.2\%$ | |
|-------------------|-------------------|------|-------------------|------|-------------------|------|
| | MUN | SE | MUN | SE | MUN | SE |
| 9.0-18.2 | 16.1 ^a | 0.18 | 15.0 ^b | 0.05 | 14.3 ^c | 0.1 |
| 18.2-27.3 | 17.1 ^a | 0.08 | 15.1 ^b | 0.05 | 14.8 ^b | 0.04 |
| 27.3-36.4 | 17.5 ^a | 0.04 | 15.6 ^b | 0.05 | 15.2 ^c | 0.03 |
| 36.4-45.5 | 17.5 ^a | 0.06 | 15.9 ^b | 0.04 | 15.4 ^c | 0.04 |
| 45.5-54.5 | 17.8 ^a | 0.04 | 16.1 ^b | 0.07 | 15.7 ^c | 0.07 |
| 54.5-63.6 | 17.9 ^a | 1.03 | 16.4 ^b | 0.03 | 15.9 ^c | 1.07 |

^{abc}Least squares means within the same row with different superscripts differ at $P \leq 0.05$.

Key words: milk urea nitrogen, milk yield and milk protein, Iranian Holstein cows

M278 Stage of lactation is associated with differences in the metabolic profiles and innate immunity in dairy cows transitioning to an organic management system. J. F. Odhiambo*, Q. Zebeli, S. Iqbal, D. A. Mansmann, U. Farooq, S. Sharma, S. M. Dunn, and B. N. Ametaj, *University of Alberta, Edmonton, AB, Canada*.

Negative energy balance during early lactation is a major concern in organic dairy herds due to restrained use of concentrates. Metabolic profiles and plasma haptoglobin (Hp) in dairy cows transitioning from conventional to organic management system were evaluated during the following periods: dry period (DP), 0–30, 30–60, and 60–90 DIM ($n = 7$ cows per period). Blood samples were obtained from cows by tail venipuncture once during the period and utilized for metabolite analysis by colorimetric methods. Data were evaluated by the mixed procedures of SAS. Concentrations of NEFA were elevated ($P < 0.01$) between 0 to 30 DIM, but did not differ between 30 to 60 and 60 to 90 DIM, and DP (259.9 ± 19.9 , 201.6 ± 21.7 , 210.4 ± 23.2 and 186.3 ± 19.8 $\mu\text{Eq/L}$, respectively). Concentrations of BHBA in the serum were also

greater ($P < 0.001$) between 0 to 30 DIM, intermediate between 30 to 60 and 60 to 90 DIM, and were lower in the DP (1037.7 ± 45.7 , 908.6 ± 50.1 , 860.9 ± 53.2 and 775.0 ± 45.5 $\mu\text{mol/L}$, respectively). Serum concentrations of cholesterol increased ($P < 0.001$) with increasing DIM and returned to nadir levels during DP (153.8 ± 6.9 , 194.9 ± 7.4 , 217.8 ± 7.7 , and 146.9 ± 6.9 mmol/L , for 0–30, 30–60, 60–90 DIM, and DP, respectively). Low glucose concentrations were observed 0 to 30 DIM, levels were intermediate during 30 to 60 and 60 to 90 DIM, and peaked during DP (51.6 ± 1.3 , 55.5 ± 1.4 , 57.3 ± 1.5 , and 61.9 ± 1.3 mg/dL , respectively, $P < 0.001$). Concentrations of lactate tended ($P = 0.08$) to be higher during the DP but remained unchanged from 0 to 90 DIM. Serum concentrations of Hp were elevated during the DP; reached peak levels during 0 to 30 DIM and decreased gradually with increasing days postpartum (344.9 ± 32.3 , 415.2 ± 32.4 , 333.8 ± 35.6 , and 267.6 $\mu\text{g/mL}$, for dry, 0–30, 30–60, 60–90 DIM, respectively, $P < 0.001$). Taken together, these data indicate that metabolic changes associated with initiation of lactation are preceded by an acute phase response in dairy cows under an organic management system.

Key words: stage of lactation, metabolic profile, organic dairy cows

M279 Delayed effect of heat stress on dry matter intake and milk yield in dairy cows. A. S. Atzori* and A. Cannas, *Dipartimento di Scienze Zootecniche, Università di Sassari, Sassari 07100, Italy.*

During summer, dairy cows in Sardinia (Italy) have marked declines of milk production even if the area in which most farms are located is considered at medium risk of heat stress. Thus, this work studied the main meteorological variables involved in the cow response to heat stress. From June to September 2009 the data related to daily herd consistency, feed supplied and refused, and milk yield (MY) were obtained from a farm management software (Ecostalla, J-Service, Arborea, Italy) currently used in one farm of Arborea (OR, Sardinia, Italy). During the same period, mean air temperature (T_m) and relative humidity (RH) were recorded, 2 m above the feed bunk, every 2 h, and the temperature-humidity index (THI) was calculated (Kliber, 1964). The daily mean values of recorded variables (range within parenthesis) were: number of lactating cows 161 ± 0.5 ; DMI 20.2 ± 0.1 (18.3–22.5) kg/cow per d ; MY 26.2 ± 0.1 (23.9–28.0) L/cow per d ; T_m 24.9 ± 2.0 (20.7–31.7) $^{\circ}\text{C}$; RH $67.1 \pm 7.6\%$ (38.6–77.8); THI 73.3 ± 2.8 (67.7–78.6) $^{\circ}\text{F}$. DMI was negatively correlated with T_m (-0.38 ; $P < 0.001$) and THI (-0.44 ; $P < 0.001$). MY was poorly associated with the same day weather variables. Correlations were higher when DMI or MY were associated to previous days T_m and THI. The highest correlation were observed with a delay of 3 d for DMI ($r = -0.56$ and -0.61 with T_m and THI, respectively; $P < 0.001$), and with a delay of 5 d for MY ($r = -0.58$ and -0.63 ; for T_m and THI respectively; $P < 0.001$). Estimated delayed stress was equal to -0.23 $\text{kg of DMI/cow per d}$ and -0.174 $\text{kg of MY/cow per d}$ per increased unit of THI above the threshold of 70°F (21°C). The RH was significant only combined with T_m in the THI. The MY on a certain day was best predicted as $\text{MY (L/cow per d)} = 25.2 - 0.095 \times \text{THI}_{-5} (^{\circ}\text{F}) + 0.391 \times \text{SSI}_{-2} (\text{kg/cow per d})$ ($r^2 = 52.6$), where the subscripts -5 and -2 indicate the days before MY. This study suggest that delayed MY losses due to heat stress can be minimized if appropriate actions are taken as soon as THI increases above the threshold.

Key words: temperature humidity index, threshold, short-time stress

M280 Effect of feed-line soaking and Niashure (NI) on heat-stressed lactating Holsteins housed in an evaporative tunnel ven-

tilated barn in Thailand. S. Rungruang*, J. Collier, and R. Collier, *University of Arizona, Tucson.*

Total of 86 lactating Holstein cows (28.2 ± 4.6 kg/d) were assigned to a completely randomized design to evaluate the impact of feed-line soaking in conjunction with 12 g/d Niashure (NI) supplementation on body temperature indices, feed intake and production parameters. All cows were housed in an evaporative tunnel ventilated barn for 21 d Jul–Aug 2010 in Nakhon Ratchasima, Thailand. The Temperature Humidity Index (THI) values inside the barn ranged from 72 – 82 and average humidity values were more than 90%. Cows had access to feed-line soaking from 12:00 to 06:00 each day and were randomly assigned to one of 2 groups, control or NI supplement. Groups were balanced for parity, days in milk and milk yield. Rectal, skin and vaginal temperatures were recorded on a subset of 10 cows per group. NI doses were split and top-dressed on ration by feeding 6 g at 06:00 and 6 g at 13:00. Feeding NI with soaking significantly reduced skin temperature but not rectal and core body temperature during peak THI periods. Dietary NI decreased shaved (30.9 vs. 32.8°C , $P < 0.01$) and unshaved shoulder (30.6 vs. 31.9°C , $P < 0.02$) skin temperature and also decreased shaved rump skin temperature (32.0 vs. 33.3°C , $P < 0.03$) at 14:00. Milk yield in NI group was lower than controls (26.2 vs. 28.5 kg/d , $P < 0.04$). We did not detect an effect of feeding NI on dry matter intake (DMI) or milk composition. Feeding NI did not lower mean core body temperature but soaking reduced body temperature and respiratory rate. Soaking decreased average rectal temperatures and respiratory rates of both groups to lowest values at 14:00 compared with 08:00, 11:00 and 16:00 (38.9°C , $P < 0.02$ and 59 breath/min $P < 0.03$). Use of NI with soaking numerically reduced average rectal temperature to the lowest values at 14:00 compared with other time points and lower when compared with control group. Results indicate that the effect of feed-line soaking reduced body temperature indices while NI supplementation in addition to soaking did not further reduce core temperatures of lactating dairy cows.

Key words: heat-stressed, niacin, soaking

M281 Economic assessment of postpartum milking frequencies on dairy farms. F. Soberon*, D. M. Galton, and T. R. Overton, *Cornell University, Ithaca, NY.*

The additional milk yield associated with increased milking frequency (IMF) during lactation has been well-documented, but implementation of this management technique depends upon the balance between potential revenue and cost. We compared the marginal profitability of cows milked 4x for 21 d followed by 2x for the remainder of the lactation (4x-2x) and cows milked 3x throughout the entire lactation (3x) to cows milked 2x throughout the entire lactation (2x). Energy-corrected milk (ECM; 3.5% fat and 3.2% true protein) increases were assumed to be 1.5 and 3.0 kg/d of ECM for 4x-2x and 3x, respectively, compared with 2x and were determined according to results from a large study on commercial farms focused on 4x-2x milking and literature reports for 3x milking. The model analysis included marginal feed cost, farm size (number of cows), parlor size (cows per hour), parlor efficiency (worker equivalents per hour of milking time), energy usage ($\$20.00$ per hour of milking) and other milking supplies ($\$0.15/\text{cow per milking}$). For an example smaller farm with 200 milking cows, an assumption of 2.5 workers per hour, a milking capacity of 50 cows per hour, 3x milking is more profitable than 2x milking at all milk prices greater than $\$15.70/45.4$ kg ; however, 4x-2x milking is more profitable than 2x milking at all milk prices greater than $\$8.35/45.4$ kg . When milk prices are higher than $\$23.40/45.4$ kg 3x milking is more profitable

than 4x-2x milking. For an example larger farm of 1,000 milking cows and 5 workers per hour with a milking capacity of 200 cows per hour, 3x milking is more profitable than 2x when milk prices are above \$9.35/45.4 kg and 4x-2x milking is more profitable than 2x at milk prices above \$5.90/45.4 kg. A 3x milking scheme on larger farms was more profitable than 4x-2x milking at milk prices above \$13.00/45.4 kg. We conclude that management decisions regarding milking frequency on any given farm should consider herd size, parlor efficiency, current milk prices along with other facility- and management-related factors that are beyond the scope of this analysis.

Key words: milking frequency, economics

M282 Milk fat and protein:fat ratio in California dairies. N. Silva-del-Río^{*1}, A. Lago², B. Verboort³, and H. Selvaraj³, ¹*University of California Cooperative Extension, Tulare*, ²*APC Inc., Ankeny, IA*, ³*AgriTech Analytics, Visalia, CA*.

The aim of this study was to report the prevalence of herds: a) with low milk fat, and b) at risk of ketosis in California dairies. Dairy Herd Improvement Association records were obtained from AgriTech Analytics (Visalia, CA). Information included milk composition at herd level [51 Jersey (JE) and 534 Holstein (HO) herds], and at cow level (2,321,563 observations from 138 HO herds) from Nov-09 to Oct-10. Milk fat (MF) depression was evaluated based on herd averages below 3.2% (HO) and 4.2% (JE), and on the proportion of cows below 2.5% of MF at any given test. The risk of ketosis was evaluated based on the proportion of cows within a herd that at first test had protein:fat ratio (P/F) less than 0.75. During the study period, 39.2% (n = 51) of the JE herds and 22.0% (n = 534) of the HO herds had at least one MF test below 4.2% and 3.2%, respectively. The proportion of JE and HO herds that had more than 25% of the tests with MF below 4.2% and 3.2% was 14.5% and 7%, respectively. The percentile distribution of cows within herd with MF <2.5% was Q1 = 2.8%, Q2 = 4.3%, Q3 = 5.8% of the cows. In 6.3% of all the tests conducted more than 10.0% (up to 27.1%) of the cows had MF <2.5%. A total of 26.1% of the herds had at least one monthly test where more than 10% of the cows tested had MF content below 2.5%. Eleven herds (8.0%) had more than 25% of their tests with at least 10% of the cows with MF <2.5%. The percentage of herds with more than 10% of the cows with MF <2.5% ranged from 3.3% in Apr and 9.5% in Nov. The risk of ketosis was evaluated and 79.0% of the herds had at least one test where cows with P/F < 0.75 at first test represented more than 40% of the herd. A large proportion of herds (25.0%) had 75% to 100% of their tests with more than 40% of the cows having P/F < 0.75. The percentage of herds with more than 40% of the cows with P/F < 0.75 ranged by month from 25.9% in Aug to 52.0% in Feb. At a given test, herds were identified where all the cows at first test had a P/F <0.75 (4 herds) or P/F > 0.75 (5 herds). This information suggests that milk fat depression and subclinical ketosis need further evaluation in California dairy herds.

Key words: milk fat, protein fat ratio, DHIA records

M283 Performance of post-weaned Holstein heifers fed a grain mix with free choice hay or a total mixed ration (TMR) containing sweet corn cannery waste, hay and dried distillers grains. D. Schimek^{*1}, D. Ziegler², B. Ziegler¹, H. Chester-Jones², M. Raeth-Knight³, and G. Golombeski³, ¹*Hubbard Feeds Inc., Mankato, MN*, ²*University of Minnesota Southern Research and Outreach Center, Waseca*, ³*University of Minnesota, St. Paul*.

Two consecutive studies were conducted to evaluate post-weaned heifer performance when fed TMR diets containing sweet corn cannery waste (SCCW), hay and dried distillers grains (DDGS). In study 1, 112 4-mo old Holstein heifers (av. 136.5 ± 1.03 kg) were assigned to 1 of 8 pens (7 heifers/pen) and 1 of 2 treatments for 56 d. Treatments included: 1) Control 16% CP grain mix fed at 2.27 kg/hd daily with free choice (FC) hay; 2) Free choice ensiled TMR (33% SCCW, 33% hay, 33% DDGS, DM basis) top-dressed with 0.75 kg protein pellet at feeding. Heifers fed the TMR had higher ($P < 0.05$) ADG (1.2 vs. 0.98 kg/d), hip height gain (+1.22 cm), body condition score change (+0.44), and gain/feed (0.23 vs. 0.17 kg BW/kg DMI) compared with those fed the control diet. For study 2, dietary composition of the TMR was modified to reduce heifer gain to approximately 1 kg/d and 126 3-mo old Holstein heifers (av. 114.3 ± 0.93 kg) were assigned to 1 of 6 pens (7 heifers/pen) and 1 of 3 treatments for 84 d. Treatments included: 1) Control 16% CP grain mix fed at 2.27 kg/hd daily with FC hay; 2) Free choice ensiled TMR (40% SCCW, 28% hay, 32% DDGS, DM basis) top-dressed with 0.14 kg mineral mix at feeding; 3) Ensiled SCCW mixed daily with hay and distillers grains (40% SCCW, 28% hay, 32% DDGS, DM basis) top-dressed with 0.14 kg mineral mix at feeding. Heifers fed the TMR diets had higher ($P < 0.05$) ADG (1.05 vs. 0.93 kg/d), hip height gain (14.1 vs. 13.1 cm), BCS change (+0.87 vs. +0.77) and gain/feed (0.28 vs. 0.22 kg BW/kg DMI) than those fed the control diet. Heifers fed the TMR diets performed similarly but a higher refusal rate was evident when the TMR was mixed daily. Under the conditions of these studies preparing a complete SCCW, hay and DDGS ensiled TMR or mixing a TMR daily with individual ingredients offers a lower cost alternative feed for post weaned heifers from 3 to 6 months of age compared to limit feeding a grain mix with FC hay.

Key words: Holstein heifers, performance, total mixed rations

M284 Effect of feeding duration on growth of group fed dairy calves during transition to an organic production system. B. J. Heins^{*}, D. G. Johnson, and E. A. Bjorklund, *University of Minnesota, St. Paul*.

Heifer calves (n = 61) were used to evaluate the effect of early life feeding duration in a group management system on body weight and hip height. Calves were assigned to feeding groups of 10 in super hutches by birth order, and were born at the University of Minnesota West Central Research and Outreach Center, Morris, Minnesota from March to June 2010. Breed groups of calves were: Holsteins (n = 9) selected for high production (HO), Holsteins (n = 14) maintained at 1964 breed average level (H64), crossbreds (n = 28) including combinations HO, Montbeliarde, and Swedish Red selected for high production (HMS), and crossbreds (n = 10) including combinations of HO, Jersey, and Swedish Red selected for durability (HJS). Early weaning (EW) groups were fed 1.5% of birth weight 13% total solids organic milk once daily until the youngest calf in the group was 4 weeks old, reduced to 0.75% of birth weight for 1 week, and then weaned when the group consumption averaged 0.91 kg starter/calf/day. Late weaning (LW) groups were fed 1.5% of birth weight of organic milk once daily, and then weaned when the group consumed 0.91 kg of starter/calf/day, and the youngest calf in the groups was 9 weeks old. Body weight and hip height were recorded at birth, weaning, and d 90 and 120. Independent variables for statistical analysis were the fixed effects of weaning group (EW or LW) and breed group. Weaning group performance was weaning age (days), EW (44.6) vs. LW (63.6) ($P < 0.01$); gain per day (kg), EW (0.42) vs. LW (0.59) ($P < 0.01$); weaning weight (kg), EW (56.4) vs. LW (73.5), ($P < 0.01$); weaning hip height (cm), EW (83.3) vs. LW (90.4) ($P < 0.01$); 90-d weight (kg), EW (91.1) vs. LW (99.7)

($P < 0.05$); and 120-d weight (kg), EW (113.3) vs. LW (118.5) ($P > 0.25$). The HO (0.51; 67.2), H64 (0.44; 60.8), HMS (0.54; 69.4), and HJS (0.53; 62.3) calves were not significantly different for gain per day (kg) or weaning weight (kg), respectively. In summary, EW calves had less body weight and hip height compared with LW calves during organic transition.

Key words: organic, crossbreeding, calf

M285 Pre- and post-weaning performance and health of dairy heifer calves fed calf starters and grain mixes with glycerol as a replacement for corn. D. Ziegler^{*1}, H. Chester-Jones¹, A. Doering², D. Timmerman², M. Raeth-Knight³, and G. Golombeski³, ¹University of Minnesota Southern Research and Outreach Center, Waseca, ²Agricultural Utilization Research Institute, Waseca, MN, ³University of Minnesota, St. Paul.

In phase 1, 120 (2–4 d old) individually fed Holstein heifer calves (40.3 ± 0.08 kg BW) were randomly assigned to 1 of 4 treatments for 56-d. Our objective was to evaluate the use of glycerol as a replacement for corn in calf starters (CS) by evaluating its impact on performance and health pre-(d 1–42) and post-weaning (d 43–56). Treatments were: 1) Complete texturized 18% CP control CS (CON); 2) Complete pellet 18% CP control CS (CONP); 3) 18% CP pelleted CS containing 3% glycerol (27.3 kg/ton; 3%GLY) and 4) 18% CP pelleted CS containing 6% glycerol (54.6 kg/ton; 6%GLY). All calves were fed a 20:20 (CP:fat) milk replacer at 0.28 kg/d powder in 2 L water 2 X daily d 1 to 35 and once daily d 36 to 42 weaning. There were no treatment differences ($P > 0.05$) in pre- and post weaning calf performance. Average daily gain and feed/gain for the nursery phase were 0.61 kg/d and 1.88 kg feed/kg BW for d 1 to 56, respectively. Health treatment costs were highest ($P < 0.05$) for calves on 6%GLY. Calves were transitioned to group pens and fed the CON CS for 7 d. One-hundred-36 calves (av. 84.7 ± 0.71 kg) were assigned to 6 replicate pens (7 calves/pen) each of 3 limit-fed grain mixes with free choice hay for a 112-d study. Treatments included: 1) 16% CP corn and pellet grain mix fed at 2.73 kg/hd daily for 56 d and 2.27 kg/hd daily from 57 to 84 d; 2) 16% CP corn and pellet mix with 3% added glycerol fed as in 1; and 3), 16% CP corn and pellet mix with 6% added glycerol fed as in 1 and 2. From d 85 to 112 all group pens were fed a common 16% CP grain mix at 2.27 kg/hd daily with free choice hay. There were no overall treatment effects on calf ADG or feed/gain ($P > 0.05$) averaging 1.04 kg/d and 4.39 kg feed/kg BW respectively. Hay intake was lowest ($P = 0.02$) for calves fed the grain mixes with glycerol. Under conditions of this study, glycerol was an effective alternative energy source when partially replacing corn in CS or grain mix formulations.

Key words: calf performance, glycerol, feed formulations

M286 Effect of lactation number, year and season of initiation of lactation on milk yield of rbST-treated cows hormonally induced into lactation. M. Mellado^{*1}, E. Antonio-Chirino², C. Meza-Herrera³, F. G. Veliz², and J. R. Arevalo⁴, ¹Autonomous Agrarian University Antonio Narro, Department of Animal Nutrition, Saltillo, México, ²Autonomous Agrarian University Antonio Narro, Faculty of Veterinary Medicine, Torreon, Mexico, ³Universidad Autónoma Chapingo, Unidad Regional Universitaria de Zonas Áridas, Bermejillo, México, ⁴University of La Laguna, Department of Parasitology, Ecology and Genetics, La Laguna, Spain.

Records representing 1,500 barren Holstein cows from a dairy farm in northern Mexico were used to determine the effects of lactation number and season and year of initiation of lactation on milk yield of cows induced hormonally into lactation and treated with rbST throughout lactation. Peak and 305-d milk yield were also assessed as predictors of total milk yield in cows. Variables related with milk yield were analyzed using the MIXED procedure of SAS. Treatment means were separated using the PDIF option of SAS. Regression analyses were applied to discern relationships between peak milk yield and total milk yield. A significant quadratic relationship was found between 305-d milk yield and number of lactation (7,607 ± 145 and 9,548 ± 181 kg for first and ≥ 6 lactation cows, respectively; mean ± SEM) with the highest production occurring in the 5th lactation. Total milk yields of cows with ≤ 2 lactations were approximately 4,500 kg less than milk yields of adult cows (the overall average ± SD milk yield was 13,544 ± 5491 kg per lactation and the average lactation length was 454 ± 154 d). 305-d milk production was depressed ($P < 0.01$) in cows induced into lactation in spring (8,804 ± 153 kg; mean ± SEM) and summer (8,724 ± 163 kg) than in fall (9,079 ± 151 kg) and winter (9,085 ± 143 kg). Partial regression coefficients for 305- milk yield and peak milk yield indicated an increment of 157 kg of milk per lactation per every kg increase in peak milk yield ($r^2 = 0.69$). Neither peak milk yield ($r^2 = 0.18$) or 305-d milk yield ($r^2 = 0.29$) were accurate for predicting total milk yield per lactation. It was concluded that year, parity, and season effects are significant influences on milk yield of cows induced into lactation and treated with rbST throughout lactation, and that peak milk yield can assist in the prediction of 305-d milk yield, but not total milk yield. This study also shows that hormonal induction of lactation is a reliable, practical and affordable technique in countries where rbST treatment and prolonged steroid administration of dairy cows is legally permitted.

Key words: lactation induction, extended lactation, somatotropin