M251 Canadian dairy producers' transition to automatic milking systems: preliminary results of a national survey. Christina Tse*[1], Trevor DeVries[2], Elsa Vasseur[3], Herman Barkema[1], and Ed Pajor[1], *[1]Department of Production Animal Health, University of Calgary, Calgary, AB, Canada, [2]Department of Animal and Poultry Science, University of Guelph, Kemptville, ON, Canada, [3]Organic Dairy Research Centre, University of Guelph, Alfred, ON, Canada.*

Usage of automatic milking systems (AMS) is becoming increasingly common in Canada. The purpose of this study was to describe producers' transition to AMS and document their satisfaction. A total of 149 AMS producers were surveyed in 9 provinces by telephone and email. The average number (±SD) of robotic units/farm was 2 ± 1. The median AMS age was 32 mo, with a range of 4 to 170 mo. Of the respondents, 88% of farms used a free-flow traffic system, while 12% used a directed traffic system. Results show that 56% of producers built a new barn and 50% changed housing systems for the transition. Concerning animal training programs, 21% of producers trained cows before first milking with the robot and 38% used a training program for heifers. It took, on average, one week to train cows (7.4 ± 6.0 d) and heifers (7.7 ± 5.9 d), but 2.7 ± 0.4 mo for the entire herd to adapt to the robot. Sixty percent of farms had cows that were not able to adapt to the robot. The median proportion of the herd culled for not adapting was 1% (with a range of 0 to 40%). The average number of lactating cows increased from 92 ± 56 to 102 ± 68. The total hours devoted to milking/day, which included moving/fetching cows, milking time, preparation and cleaning of milking system, decreased by 40%. Milking frequency averaged 3.1 ± 0.4 milkings/day. The majority (84%) of surveyed farms experienced an increase in milk yield from their previous milking system. The median bulk tank somatic cell count (SCC) was 180,000 cells/mL, with a range of 43,000 to 375,000 cells/mL. Changes in bulk tank SCC were variable with producers reporting increases, decreases or no change. Producers also reported an increase in time flexibility, life quality and a willingness to recommend AMS to other dairy producers. Transitioning to an AMS requires effort in training cows and learning a new management system. Producers reported that AMS have met their economic and lifestyle expectations, while improving animal welfare.

Key Words: automatic milking, dairy producer, transition

M252 A stochastic dairy farm model to evaluate the effect of changes in technical or economic factors on performance and benefits. Sergio Calsamiglia*[1], Susana Astiz[2], Lorena Castillejos[1], Carlos Lopez de Toro[1], and Joaquim Baucells[3], *[1]Universitat Autonoma de Barcelona, Bellaterra, Spain, [2]INIA, Madrid, Spain, [3]Centre Veterinari Tona, Tona, Spain.*

Dairy farms are constantly challenged with decisions. The evaluation of the outcome of such decisions requires the integration of technical and economic effects over time. The complexity of the multiple interactions can be resolved with the use of mathematical models that integrate biological and economical processes. The objective of the study was to develop a stochastic model to simulate technical and economic consequences of changes implemented in dairy farms. Individual cows of a dairy farm are uploaded. Data on reproduction, diseases, economics, labor, finances, management decisions, facilities and environment are introduced (default values are provided). Farm performance is modeled over a period and technical and economic performance is provided in the output. An 810 dairy cow farm (10,800 L/cow/year), 205 DIM, 15% pregnancy rate with average incidences of diseases and prices was used as a model. Three scenarios were tested: (1) CON = No change in the current conditions; (2) CULL = Increase in voluntary culling rate by 5 percentage units (31 vs. 36%); and (3) SEMEN = Change from the use of low cost semen vs. high cost semen (€10 vs. €20) assuming that the use of the more expensive semen results in an increased genetic potential of 2% in the daughters. A simulation of 10 years was repeated 40 times with stable technical and economic conditions. At the end of the 10-year simulation, CULL increased benefits by 14%. Treatment SEMEN resulted in reduced income for the first 5 years, probably due to the increased cost of semen and the time required for the expression of the genetic improvement. After the 10-year simulation, SEMEN accumulated a 20% loss, although in the year 10 of simulation SEMEN had a 16% higher benefit. It took 13 years to reach the breakeven point for SEMEN. Although genetic improvement cannot be ignored in dairy farms, the benefits are long-term. In contrast, CULL resulted in short and medium term benefits.

Key Words: model, dairy farm, economic performance

M253 Changes in temperature-humidity index and number of hot days related to heat stress of dairy cattle in Thailand. Thirarat Sae-tiao[1], Skorn Koonawootrittriron*[1], Thanathip Suwanasopee[1], and Mauricio A. Elzo[2], *[1]Kasetsart University, Bangkok, Thailand, [2]University of Florida, Gainesville, FL.*

Global climate is changing and becoming warmer. Higher ambient temperatures and humidity increase stress and lower dairy cattle production, particularly in tropical countries. Temperature-humidity index (THI) has been used to assess the risk of heat stress in dairy cattle. When THI exceeds 72, cows are likely to begin experiencing heat stress. The objective of this research was to characterize yearly changes in THI and number of days that THI exceeded 72 (NHD) in Thailand from 2002 to 2014. Average daily temperatures and relative humidity were measured in 17 meteorological stations located in 5 regions across Thailand (n = 78,713). Regions were Northern, Northeastern, Central, Eastern, and Southern. The overall yearly means and SD were 81.9 and 4.2 for THI and 361.5 d and 13.8 d for NHD, and the corresponding ranges were 58.7 to 93.2 for THI and 166 to 366 d for NHD. The THI and NHD were analyzed using a model that included year, region and interaction between year and region as fixed effects, and residual as a random effect. All fixed effects influenced THI and NHD ($P < 0.01$). Yearly LSM ranged from 79.3 (Northeastern-2011) to 84.1 (Central-2010) for THI, and from 315 (Central-2002) to 366 d (Southern-2012) for NHD. Trends across years were non-significant for THI (b = −0.003 units/yr; $P = 0.93$) and for NHD (b = 0.39 d/yr; $P = 0.34$). However, larger fluctuations in THI existed from 2009 to 2014 than from 2002 to 2008 (81.3 to 83.3 vs. 81.5 to 82.4). Conversely, NDH showed similar ranges in both periods (349 to 364 d vs. 341 to 357 d). The LSM for THI and NHD were higher in the Central (83.0 and 354 d), Eastern (83.0 and 363 d), and Southern (82.8 and 361 d) regions than in the Northeastern (80.6 and 344 d) and Northern (80.6 and 346 d) regions. Although increasing trends in THI and NHD did not occur during the years of the study, variability in THI increased since 2009. Regional effects indicated that more comprehensive strategies for reduction of heat stress in dairy cattle might be needed in the Central, Eastern, and Southern Thailand than in the Northern and Northeastern parts of the country.

Key Words: environment, dairy, tropic

M254 Checks and balances: Evaluating reliability of dairy nutrient management data to better protect groundwater resources. Christine Miller* and Deanne Meyer, *University of California, Davis, Davis, CA.*

To protect groundwater from further nitrate contamination, California regulations prohibit dairy producers from applying more than 140% of the nitrogen (N) that their crops remove. The regulations require copious annual reporting of crop field management, farm infrastructure, and animal population. The data collected in these annual reports could be integral to evaluating and improving both farm practices and the regulations themselves. Data reliability and accuracy must be assessed to use the information responsibly. Annual Reports from 18 dairies were obtained to assess reliability. Mass balance calculations were preformed to check the self-consistency of data within a facility. The results of mass balance calculations show that the data do not account for a remarkably large percentage of the nutrients being produced on the farms. Literature suggests that over 60% of N and 90% of P should be recovered; however, a median of only 25% of both N and P in cattle manure was recovered based on annual report data. This could be due to many different causes including inaccurate nitrogen sampling and analysis techniques, systematic reporting errors, or fraudulent reporting. Given that the accuracy of the majority of the recommended sampling and analysis protocols has not been assessed, it is likely that these methods are a significant source of error. Projects that should improve data collection protocols in both the short and long term are in progress. Online decision trees are being developed to help farmers self-assess their current data collection practices, and provide personalized suggestions for improvement. Additionally, I will use a statistical modeling approach paired with field experiments to examine the uncertainty in these recommended protocols (and thereby the overall uncertainty in regulations). By separating the various sources of measurement error, the model will identify the best ways to improve data collection and regulation efficacy. Results of this and future studies will influence future nutrient management regulations in California and other states with active livestock industries.

Key Words: dairy waste management, nitrate leaching

M255 Reproductive performance of North American dairies by geographic region. Cristian F. Vergara*[1,2], Flavio Bitencourt[1], Lydia M. Johnson[1], Diego Vallejo[1], and Hernando Lopez[1], *[1]ABS Global Inc., DeForest, WI, [2]ABS Chile Ltda., Santiago, Chile.*

Our objectives were to compare reproductive indicators from Holstein, Jersey and Crossbred dairies in 4 regions of United States of America and establish benchmarks for the 20% most efficient herds. Data from 290,351 cows and their records in DC305 were collected from February to November 2014 from a sample of 162 ABS customers. Regions (herds) represented were: Eastern (E; n = 28), Midwestern (MW; n = 58), Northwestern (NW; n = 10), and Southwestern (SW; n = 66). Univariated analyses were conducted with the MIXED and FREQ procedures of SAS using herd as the experimental unit. The Regions differed ($P < 0.05$) by mean (SE) herd size (E = 1,022 ± 580; MW = 690 ± 537; NW = 4,919 ± 496; SW = 2,760 ± 533) and kg of daily milk production (E = 37.4 ± 1.7; MW = 36.1 ± 1.6; NW = 32.3 ± 1.5; SW = 36.5 ± 1.6). Crossbred were not represented in the South Regions and Jerseys not represented in MW, making this effect significant ($P < 0.05$). The West Regions had a lower use of timed AI ($P < 0.05$) than E and MW (E = 46.1%; MW = 49.1%; NW = 17.6%; SW = 15.4%); but a lower conception rate (CR) ($P < 0.05$) than E and MW Regions (E = 36.6%; MW = 36.9%; NW = 31.5%; SW = 32.7%). Regarding insemination risk, only MW did lower ($P < 0.05$) than the other 3 Regions (E = 63.8%; MW = 52.8%; NW = 62.3%; SW = 61.8%). As a result, the E Region had the best pregnancy risk (PR) and MW the lowest (E = 22.9%; MW = 18.2%; NW = 20.0%; SW = 20.3%). The West Regions reported a higher ($P < 0.05$) pregnancy loss (E = 11.4%; MW = 10.3%; NW = 16.0%; SW = 13.3%). The 20% most efficient herds based on PR ranking (n=71) had a mean PR of 24%. Breeds were represented in both strata and was not a significant effect ($P > 0.05$). The top 20% had a 10 points higher insemination risk (mean 64%) and a 6 points higher CR (mean 38%) than bottom 80% ($P < 0.05$). Additionally, they breed open cows at pregnancy diagnosis 3 days earlier (mean 10 ds), but did not differ in timed AI usage ($P > 0.05$). The top 20% herds were not different in their daily milk production, voluntary waiting period, and pregnancy loss in comparison with the bottom 80% ($P > 0.05$). Despite regional differences, the best combination of factors led the East Region to achieve the highest PR. The top 20% herds in PR had higher overall reproduction but did not differ in herd management performance with the bottom 80%. Further analysis is needed.

Key Words: dairy, reproduction

M256 Lactation stage alters the rumen protozoal communities in three breeds of primiparous dairy cattle. L. M. Cersosimo*[1], M. Bainbridge[1], A.-D. G. Wright[2], and J. Kraft[1], *[1]University of Vermont, Burlington, VT, [2]University of Arizona, Tucson, AZ.*

Rumen protozoa are anaerobic ciliates that degrade fiber, starch, and proteins consumed by the host. The objective of our study was to determine if breed (B) or lactation stage (LS) affect the rumen protozoal community. Whole rumen digesta samples were collected at 3 and 93 d in milk (DIM) from 7 Holstein (H), 8 Jersey (J), and 7 Holstein-Jersey crossbreds (X) co-housed in free stalls. To characterize the rumen protozoa, the V3-V4 region of the 18S rRNA gene was amplified with the primers 316F and 758R. Sequence reads were produced by Illumina MiSeq (v.3) and the program Mothur was used for all bioinformatics analyses. The protozoal densities (cells/mL digesta) were determined by real-time PCR amplification of the 18S rRNA gene. The effects of B, LS, or B x LS on rumen protozoa were evaluated with the PROC MIXED model in SAS. At 3 DIM, 307,739 sequence reads clustered at a 4% cutoff into 3–21 operational taxonomic units (OTU) per animal with means of 5, 6, and 7 for H, J, and X, respectively. At 93 DIM, 536,846 sequence reads clustered into 1–15 OTU per animal with an average of 3 OTU for each breed. For both stages, greater than 98% of the sequences clustered with OTU 1, belonging to the family, *Ophryoscolecidae*. The OTU-based diversity measures, Shannon index ($P < 0.01$), Inverse Simpson index ($P < 0.05$), and Chao I estimator ($P < 0.001$) showed greater diversities at 3 DIM. The abundances of protozoal genera *Epidinium* (0.4–9.3% abundance), *Ostracodinium* (3.5–21.6%), *Ophryoscolex* (0.2–3.0%), and *Polyplastron* (2.4–7.1%) were affected by LS ($P < 0.05$). However, no differences in abundance were observed in the genera, *Entodinium* (19.8–36.3%), *Metadinium* (0.8–21.2%), *Isotricha* (0.3–1.7%), or *Diploplastron* (0.7–2.7%). *Eudiplodinium* spp were less abundant in H than in X ($P < 0.05$), respectively, at 3 DIM (H: 2.0, X: 12.2%) and at 93 DIM (H: 2.6, X: 20.3%). Protozoal densities at 3 DIM (10^4-10^6 cells/mL) and 93 (10^3-10^6 cells/mL) DIM did not differ. The present study suggests that early and peak LS, but not B, affects the rumen protozoal community in primiparous dairy cattle.

Key Words: ciliates, 18S, diversity

M257 Quality of hatching eggs from different broiler breeder ages. Vanessa Michalsky Barbosa*[1], Bruno Delphino Medrado[1,2], Isabela Cláudia Barbosa Santos[1], Larissa Kiana Santos Azevedo Martins[1], Taís Pinheiro Borges Silva[1], Tayana Nery Franca[1], Silvania Belo Dourado[1], Juliana Cantos Faveri[1], and Lia Muniz Barretto Fernandes[3], *[1]Department of Animal Science, Faculty of Veterinary Medicine and Animal Science, Federal University of Bahia, Salvador, Bahia, Brazil, [2]Federal Institute of Education, Science and Technology–Santa Inês Campus, Santa Inês, Bahia, Brazil, [3]Department of Animal Production, Faculty of Veterinary Medicine and Animal Science, Federal University of Bahia, Salvador, Bahia, Brazil.*

Several requirements before and during the artificial incubation process interfere with the success of the day-old chicks production, and the quality of the eggs to be incubated is an important factor to be considered. The aim of this study was to investigate the characteristics of young and old broiler breeder eggs. We studied 200 incubating eggs produced by Cobb broiler breeders aged 29 wk (n = 100) and 62 wk (n = 100). It was used a completely randomized design. The treatments were the age and each egg was considered replication. The eggs were weighed (EW), and also its components: eggshell (ES%), yolk (Y%) and albumen (A%). Specific weight analysis (SW) was determined by the solutions of different densities method. The eggshell resistence (ER) was analyzed by compression strength test. The means of eggshell thickness (ET) and number of pores (PO) were obtained in 3 different regions. Additionally we evaluated albumen pH (pHA), yolk pH (pHY), albumen height (AH), yolk height (YH) and Haugh Units (HU). Data were analyzed using PROC GLM of SAS 9.2 and the means were compared by F test. EW, Y%, pHA were higher ($P < 0.05$) from the old flock as compared with the young flock (72.48 vs 57.91 g; 31.19 vs 26.30%; 8.84 vs 8.64; respectively). ES%, A%, SW, ER, ET, PO, AH, HU were higher ($P < 0.05$) from the young flock as compared with the old flock (8.99 vs 8.71%; 64.70 vs 60.10%; 1.082 vs 1.076 g/mL H_2O; 2320 vs 2158 g; 0,438 vs 0,428 mm; 122 vs 105 pores/cm^2; 8,12 vs 7,19 mm; 82,22 vs 71,61 HU; respectively). There was no effect between the treatments for pHY and YH. The hatching eggs quality from 62-wk-old broiler breeder is less than that of 29-wk-old broiler breeder. Due to the influence of the structural characteristics of eggs in embryo development, it is necessary to monitor the quality parameters and performing further studies that aim adapt the conditions of the incubation process according to the egg to be incubated.

Key Words: artificial incubation, eggshell, poultry production

M258 Effects of turning duration during incubation and broiler breeder age on hatchability, chick organs, and poultry performance. Vanessa Michalsky Barbosa*[1], Bruno Delphino Medrado[1,2], Mariana André Pompeu[3], Júlia Sampaio Rodrigues Rocha[3], Edgard Onoda Luiz Caldas[3], Genilson Bezerra Carvalho[4], Leonardo José Camargos Lara[3], and Nelson Carneiro Baião[3], *[1]Department of Animal Science, Faculty of Veterinary Medicine and Animal Science, Federal University of Bahia, Salvador, Bahia, Brazil, [2]Federal Institute of Education, Science and Technology–Santa Inês Campus, Santa Inês, Bahia, Brazil, [3]Department of Animal Science, Veterinary School, Federal University of Minas Gerais, Belo Horizonte, Minas Gerais, Brazil, [4]Department of Animal Science, Veterinary Medicine and Animal Science School, Federal University of Goiás, Goiânia, Goiás, Brazil.*

We evaluated in an industrial scale, the effects of turning duration (15, 17 and 19 d) in the incubation phase and Cobb broiler breeder age (33 and 63 weeks) on the hatchability of fertile eggs (HF), the weights of the heart (HW) and yolk sac (YSW) and their relation to the weight of chicks: (HW/CW and YSW/CW, respectively). The poultry performance was analyzed by chick weights during the housing (BW1), broiler weights at 42 d old (BW42), weight gain from 1 to 42d (WG), feed intake from 1 to 42d (FI), feed conversion from 1 to 42d (FC) and viability from 1 to 42d (VIAB). It was used a completely randomized design. Eighteen trays (replication) with 96 eggs each were used for the evaluation of hatchability. For the organs it were used 36 chicks per treatment, and the chick was considered the replication. To evaluate the poultry performance, we used 6 pens with 25 birds per treatment, with pen considered the repetition. Eggs were set in an incubator Casp CMg 125E multistage. On the 15th, 17th or 19th days of incubation, the cessation of egg turning was performed and the eggs were transferred to the hatchers. The unhatched eggs were analyzed to determine infertility. The male chicks were housed in an experimental stable and the performance parameters were measured weekly. Data were analyzed using PROC GLM of SAS 9.2 and the means were compared by F test. In the incubation phase, we used a split plot design and in the performance phase it was used a factorial design. Compared with old flocks, chicks and broilers from young breeder flocks had lower HW (0.36 vs 0.40 g), YSW (5.28 vs 6.47 g), YSW/CW (12.5 vs 13.5%), BW1 (40.0 vs 44.7 g), BW42 (3047.6 vs 3131.4 g), WG (3007.6 vs 3086.8 g) and FI (4860.8 vs 4989.3), independent of the turning duration, but there were no effects of breeder age on HF, HW/CW, FC, VIAB. There were no effects of turning duration, regardless the breeder age. The turning can be discontinued after 15 d of incubation without negative effects on hatchability, heart weight, yolk sac weight, and poultry performance.

Key Words: animal production, day-old chick, embryo development

M259 Health, milk yield and quality for Parmigiano Reggiano cheese evaluated in cows fed OmniGen-AF from dry-off to 150 days in milk. Ludovica M. E. Mammi*, Mattia Fustini, Elena Bonfante, Alberto Palmonari, Giorgia Canestrari, and Andrea Formigoni, *Department of Veterinary Medical Sciences, University of Bologna, Ozzano Emilia, Italy.*

One hundred ninety-one Holstein and x-bred cows were used to study the effect of feeding OmniGen-AF (OG, Phibro Animal Health, Quincy, IL) from dry-off to 150 d in milk (DIM) on health, milk yield (MY) and milk components for making Parmigiano Reggiano cheese. Cows were assigned randomly to either a control (C, n = 95) or a group fed 55g/h/d of OG (n = 96). Groups were balanced on parity, breed, expected calving date, BCS and previous MY. Cows were housed in comparable pens during the dry and lactation phases with diets fed as TM rations. Cows were milked 2× and MY recorded daily using Afimilk. Individual cow milk was sampled at dry-off, once between DIM 4 and 10 and then every 4 wk to 150 DIM and analyzed for fat, casein, protein, lactose, somatic cell count (SCC), acidity and lactodynamographic analysis (LDG). Health events were recorded. Treated or culled cows (n = 43) were excluded from the statistical analysis for milk production and quality. Milk was analyzed by ANOVA-Repeated Measures, SCC by Kruskal-Wallis test and all data processed using Statsoft Statistica v.10. Significance declared at $P \leq 0.05$. MYs were not different, although OG cows tended ($P = 0.25$) to produce more milk (+1.39kg/d) with a lower SCC linear score (−0.06, $P < 0.10$) than C cows. A higher % of milk samples (23%) in C group had SCC > 300,000 cells/mL ($P < 0.10$) compared with OG cows (18.2%). The same trend was observed in cows with 2 or more samples > 300,000 cells/mL (C = 32.4%, OG = 22.9%, $P = 0.27$). Milk composition did not differ between C and OG cows, except milk from OG cows had a tendency ($P = 0.12$) for a better LDG score (OG = 18.24, C = 19.24). Culling rates were higher in the C cows group (12.6%) compared with OG (7.4%) and culling tended

to occur sooner (DIM) for C cows than OG cows (57.3 vs. 102.6, $P < 0.10$). Incidence rates (%) of mastitis and metritis were higher in the C (18.9, 17.9) versus the OG cows (10.4, 15.6). In this study, cows fed OG from dry-off to 150 DIM tended to have fewer diseases and culls, plus a tendency for improved MY and properties associated with quality Parmigiano Reggiano cheese.

Key Words: OmniGen-AF, Parmigiano Reggiano, health

M260 Body weight gain of dairy heifers fed diets with *Origanum vulgare* or *Camellia sinensis* extracts. Vivian Fischer*[1], Giovani Jacob Kolling[1], Débora Strider[1], Dejani Maira Panazzolo[1], Carolina da Silva dos Santos[1], Alexandre Mossate Gabbi[1], Mateus Wanderer[1], Andress Sopelsa[1], and Renata Wolf Sune Martins da Silva[2], *[1]Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil, [2]Empresa Brasileira de Pesquisa Agropecuária, Bagé, RS, Brazil.*

Biological effects of plant extracts containing essential oils and polyphenols have been extensively studied for humans and nonruminant production animals, but in vivo studies with ruminants in field conditions are relatively scarce. This work aimed to investigate the effect of addition of *Origanum vulgare* or *Camellia sinensis* extracts upon average daily weight gain (ADG) of dairy heifers. Two trials were conducted for 70 d to test the levels of *Origanum vulgare* (0, 2.5, 5, 7.5 g/heifer/day) and *Camellia sinensis* (0, 1, 2, 3 g/heifer/day) extracts. Trial 1 used 32 Holstein heifers with initial overall BW 442.1 ± 96 kg and trial 2 used 34 heifers: 11 Jersey and 23 Holstein, with initial overall BW 305 ± 42 kg. Heifers grazed range pasture (trial 1) and Tifton (*Cynodon dactylon*; trial 2) and were individually supplemented with 2.5 and 1.5 kg of concentrate once a day in the morning, in trials 1 and 2, respectively. Heifers were weighed on day −14 (used as covariate), and afterward, on d 1, 28 and 56 after the inclusion of the extracts into the concentrate. Data of each trial was submitted to variance analysis, using the Mixed procedure of SAS according to a completely randomized design, considering the effect of diet (n = 4), period, interaction diet x period, breed and interaction diet × breed (just for trial 2) and the initial body weight as a covariate. Heifers supplemented with *Origanum vulgare* extract did not change daily weight gain and overall ADG was 0.56 kg. Heifers supplemented with 1 g of *Camellia sinensis* extract had greater ADG ($P < 0.05$) than those fed with zero and 3 g of *Camellia sinensis* extract. Inclusion of 1 g of *Camellia sinensis* extract increased ADG 11%. In this study feeding *Carmllia sinensis* at 1g/heifer daily improved ADG of dairy heifers.

Table 1 (Abstr. M260).

	Trial 1 – *Origanum vulgare* (g/heifer/day)					Trial 2 – *Camellia sinensis* (g/heifer/day)				
Item	0	2.5	5.0	7.5	$P > F$	0	1	2	3	$P > F$
ADG (kg/d)	0.62[a]	0.68[a]	0.66[a]	0.73[a]	NS	0.55[a]	0.61[b]	0.57[ab]	0.52[a]	*

*$P < 0.05$.

Key Words: *Camellia sinensis*, *Origanum vulgare*, weight gain

M261 Effect of cow BCS during gestation on performance variables of the offspring. Rodrigo Marques*, Reinaldo Cooke, Murilo Rodrigues, Bruno Cappellozza, and David Bohnert, *Oregon State University-EOARC, Burns, OR.*

The objective of this experiment was to evaluate the effects of cow BCS during gestation on productive parameters of the offspring. Ninety-seven Angus × Hereford cows pregnant to AI and to the same sire were assigned to the study based on their BCS during gestation: (1) ADQ = cows with adequate BCS throughout gestation (n = 20), (2) INDQ = cows with inadequate BCS throughout gestation (n = 20), (3) EARLY = cows that gained BCS during the first trimester of gestation and maintained BCS until calving (n = 19), (4) MID = cows that gained BCS during the second trimester of gestation and maintained BCS until calving (n = 19), and (5) LATE = cows that gained BCS during the third trimester of gestation and maintained BCS until calving (n = 19). Upon calving, calf BW was recorded. Approximately 60 d after calving, cow milk production was assessed using the weigh-suckle-weigh technique (12 h calf removal following by 30 min of nursing). Calves were weaned at 7 mo of age. All data were analyzed with the MIXED procedure of SAS. Cow BCS did not change ($P \geq 0.30$) for ADQ and INDQ cows during gestation (average 4.6 and 6.0, respectively) and increased ($P \leq 0.01$; based on BCS collected at AI, beginning of the second and third trimesters of gestation, and calving) for EARLY (4.4, 5.4, 6.0, and 6.1; SEM = 0.2), MID (4.4, 4.5, 6.1, and 6.1; SEM = 0.2), and LATE (4.5, 4.6, 4.7, and 5.9; SEM = 0.2). No treatment effects were detected ($P \geq 0.42$) for calving rate (93, 100, 93, 100, and 100%, respectively; SEM = 5), calf BW at birth (45.2, 42.8, 43.2, 44.3, and 42.2 kg, respectively; SEM = 2.1), and estimated cow milk production (14.8, 13.7, 13.4, 14.2, and 15.7 kg/d, respectively; SEM = 1.6). However, calves from cows that gained BCS during gestation (EARLY, MID, and LATE) were heavier at weaning compared with calves from cows that maintained BCS during gestation (ADQ and INDQ; 253, 251, 260, 268, and 264 kg, respectively; SEM = 3.5). Therefore, these results indicate that increasing BCS during gestation in beef cows benefits weaning BW of the offspring,

Key Words: cow BCS, gestation, offspring performance

M262 A comparison of two evaporative cooling systems on a commercial dairy farm in Saudi Arabia. Xavier A. Ortiz*[1], John F. Smith[1], Fernando Villar[1], Laun W. Hall[1], Jamison D. Allen[2], Andrew Odde[3], Adnan al-Haddad[3], Peter Lyle[4], and Robert Collier[1], *[1]The University of Arizona, Tucson, AZ, [2]Northwest Missouri State University, Maryville, MO, [3]Al Safi Dairy Company, Al-Kharj, Kingdom of Saudi Arabia, [4]Schaefer Ventilation Equipment, Sauk Rapids, MN.*

Efficacy of 2 cooling systems, (Korral Kool, KK; Korral Kool Inc., Mesa, AZ, FlipFan dairy system, FF; Schaefer Ventilation Equipment LLC, Sauk Rapids, MN) was estimated utilizing 4 hundred multiparous Holstein dairy cows randomly assigned to one of 4 cooled California style shade pens (2 shade pens per cooling system). Each shaded pen contained 100 cows (DIM = 58 ± 39 d, milk production = 56 ± 18 kg/day and lactation = 3 ± 1). Production data (milk yield and reproductive performance) were collected during 4 mo (May–August, 2013) and physiological responses (core body temperature, respiration rates, skin temperatures and resting time) were measured, in June and July to estimate responses of cows to the 2 different cooling systems. Water and electricity consumption were recorded for each system. Cows in the KK system displayed slightly lower respiration rates in the month of June ($P < 0.05$) and lower skin temperatures in June and July ($P < 0.05$). However, no differences were observed in the core body temperature of cows, resting time, DMI, milk yield, services/cow and conception rate between systems. The FF system utilized less water and electricity during this study ($P < 0.05$). In conclusion, both cooling systems (KK and FF) were effective in mitigating the negative effects of heat stress on cows housed in arid environments while the FF system consumed less water and electricity and did not require use of curtains on the shade structure.

Key Words: heat stress, dairy cow, evaporative cooling

M263 Association between changes in body condition score and back fat thickness during the transition period with fertility and health events in Holstein cows. P. D. Carvalho* and P. M. Fricke, *Department of Dairy Science, University of Wisconsin-Madison, Madison, WI.*

Our objective was to assess the association between body condition score (BCS) change and back fat thickness (BFT) during the transition period with pregnancies per AI (P/AI) and health events in Holstein cows in a prospective cohort study. Measurement of BCS and BFT in Holstein cows (n = 645) began ~3 wk before calving, and at 4 ± 3, 25 ± 3, 52 ± 3, 80 ± 3, and 113 ± 3 d after calving. All cows received a timed artificial insemination (TAI) at 80 ± 3 DIM after a Double Ovsynch protocol. Health events included milk fever, ketosis, retained placenta, DA, mastitis, and respiratory disorders. Data were analyzed using logistic regression with GLIMMIX and ANOVA with MIXED procedures of SAS. Changes in BCS before but not after calving were associated with P/AI at first TAI. Cows were grouped based on BCS change (5 point scale; 0.25 point increments) before calving as follows: 1) cows that lost ≥0.5; 2) cows that lost 0.25; and 3) cows that maintained or gained BCS. Change in BCS before calving differed ($P < 0.01$) among groups and was −0.57; −0.25; and 0.03 for cows in groups 1, 2, and 3, respectively. Change in BFT before calving differed ($P < 0.01$) among groups and was −2.49, −1.32, and −0.66 mm for cows in groups 1, 2, and 3, respectively. The proportion of cows with ≥1 health event during the first 120 DIM differed ($P = 0.01$) among groups and was 77% (54/70), 60% (105/174), and 62% (116/186) for cows in groups 1, 2, and 3, respectively. At 32 d after TAI, P/AI differed ($P = 0.04$) among groups and was 37% (23/62), 48% (73/153), and 55% (92/168) for cows in groups 1, 2 and 3, respectively. Cows with ≥1 health event had fewer P/AI compared with healthy cows [47% (180/379) vs. 64% (127/199), respectively]. The proportion of cows culled by 300 DIM did not differ ($P = 0.74$) among groups and was 25% (14/56), 27% (36/135) and 23% (33/145) for cows in groups 1, 2, and 3, respectively. We conclude that cows that lost BCS before calving lost more back fat, had fewer P/AI, and had more health events during the first 120 d of lactation. Supported by USDA NIFA Hatch project 231440.

Key Words: fertility, body condition score, back fat thickness

M264 Effect of an automated teat preparation system on teat skin bacterial counts. Cecilia Baumberger* and Pamela L. Ruegg, *University of Wisconsin, Madison, WI.*

The aim of this study was to compare reduction in bacterial counts of teats cleaned using a commercial teat scrubber system (TS; FutureCOW, Longwood, FL) or using conventional premilking preparation (CONV). Cows (n = 394) from 10 WI dairy farms that were currently using TS were assigned to either CONV (n = 198; 20/farm) or TS (n = 196; 20/farm) premilking routines. CONV preparation consisted of forestripping, predipping using 0.5% iodine and drying with a cloth towel. Preparation with TS was performed using chlorine dioxide and varied according to each farm routine; most included forestripping and some included a dry prewipe. Teat skin swabs were collected before and after sanitation and analyzed for total bacteria count (TBC), *Strep.* spp., *Staph.* spp. and gram-negative bacteria (GNB). Reduction (RED) in each bacterial count was the difference between the $\log_{10}$ values before and after sanitation. RED was assessed using models that included treatment (CONV and TS), farm and treatment by farm interactions. For preparation using TS, the influence of the concentration of chlorine dioxide on RED was assessed using PROC GLM (SAS Institute, 2008). For teats prepared by CONV, RED was 2.26, 2.34, 2.23 and 2.04 $\log_{10}$ cfu/mL for TBC, *Strep.* spp., *Staph.* spp. and GNB, respectively. For TS, RED was 1.97, 2.14, 1.97 and 2.79 $\log_{10}$ cfu/mL for TBC, *Strep.* spp., *Staph.* spp. and GNB, respectively. However, significant interactions of treatment by farm were identified for RED in all bacterial counts. Differences in RED based on preparation were not different for TBC (7 farms), *Strep.* spp. (8 farms), *Staph.* spp. (8 farms) or GNB (7 farms). Teats receiving CONV prep had greater RED of TBC on 3 farms, of *Strep.* spp. on 2 farms and of *Staph.* spp. on 2 farms. In contrast, RED in GNB was greater for teats prepped using TS for cows on 3 farms. For all bacterial counts, the concentration of chlorine dioxide was positively associated with increased RED. Results of this study suggest that TS can achieve similar RED in bacterial counts on teat skin but effectiveness of premilking teat preparation is influenced by management practices that differ among farms.

Key Words: teat sanitation, teat skin bacterial count

M265 Effect of timing of insemination of lactating Jersey cows with sex-sorted semen on probability of pregnancy. Gabriel D. Bombardelli[1], Henrique F. Soares[1], and Ricardo C. Chebel*[1,2], *[1]University of Minnesota, St Paul, MN, [2]University of Florida, Gainesville, FL.*

The objectives of the current experiment were to determine the effect of interval from reaching activity threshold to artificial insemination with sex-sorted semen on probability of pregnancy. Jersey cows (n = 500) from a commercial dairy herd were fitted with a rumination/activity SCR collar at approximately at 42 ± 7 d postpartum. Cows were presynchronized with 3 injections of prostaglandin-F2α given 14 d apart starting on d 39 ± 3 postpartum. Cows in estrus, based on tail paint removal, after 50 ± 3 d postpartum were inseminated by 1 of 3 technicians. Only cows inseminated in estrus were used in the experiment. Cows were examined for pregnancy at 31 ± 3 and 66 ± 3 d after insemination. A sub-sample of cows (n = 35) were examined by ultrasound every 8 h after onset of estrus to determine time of ovulation, which was determined by the disappearance of a growing follicle ≥10 mm in diameter. Ovulation was estimated to have occurred between the exam in which it was last recorded and the exam in which it had disappeared. Dichotomous data were analyzed by logistic regression with a model that included interval from onset of estrus to insemination (linear, quadratic, and cubic), parity, yield of energy corrected milk, and insemination technician. Interval from onset of estrus to ovulation was analyzed by ANOVA with a model that included size of the follicle at the first ultrasound exam, number of follicles >10 mm in diameter in the first exam, and yield of energy corrected milk. The mean (±SEM) and median intervals from reaching activity threshold to ovulation were 25.7 ± 1.2 h and 27 h (95% CI = 25, 28.2 h), respectively. Interval from onset of estrus to insemination tended to affect probability of pregnancy at 31 ± 3 and 66 ± 3 d after AI in a quadratic manner. Probability of pregnancy 66 ± 3 d after AI increased from 23% to 44%, when AI occurred between 4 and 29 h, respectively, after cows reached activity threshold. Insemination of lactating dairy cows with sex-sorted semen closer to expected ovulation yields the highest probability of pregnancy.

Key Words: timing of insemination, lactating Jersey cow, sex-sorted semen

M266 Determining the effect of transporting dairy cattle after calving on production and reproduction performance. Danilo Domingues Millen*[1], Joaquim Baucells[2], and Sergio Calsamiglia[3], *[1]Sao Paulo State University, Dracena, Sao Paulo, Brazil, [2]Centre Veterinari Tona, Tona, Spain, [3]Animal Nutrition and Welfare Service, Universidad Autonoma de Barcelona, Bellaterra, Spain.*

Recently, it has been suggested that concentration of calvings in a centralized facility (FAC) may allow specialization of the drying, transition and freshening period. However, that requires the transportation of fresh cows to the host farm after calving. The objective of this study was to evaluate if transportation after calving affects milk production and reproductive performance of lactating dairy cows. A data set of 762 dairy cows from a commercial farm in Spain was used. After drying, 519 cows were transported from host farm to FAC (~80 km). The other 243 cows were at FAC, and they were not transported. Dry and production diets were identical in both farms. Milk production of previous (L-1; with no transportation) and current (L0; after transportation) lactation was recorded. Days open and current milk production were the dependent variables in the analysis, and previous milk production was used as co-variable. Transportation of cows after calving, from FAC back to the host farm, had greater 305-mature milk production when compared with cows that remained at FAC all the time (11,925 kg vs. 10,708 kg; $P < 0.001$). Transportation had no effect ($P > 0.20$) on days open (121 vs. 132). In a second analysis, the effect of DIM at time of transportation from FAC to the host farm on productive and reproductive performance was evaluated. The 519 transported cows were divided into 2 groups: 1) cows transported from FAC back to host farm at less than 8 DIM (n = 149); and 2) cows transported from FAC back to host farm at more than 7 DIM (n = 370). Cows transported earlier had greater 305-mature milk production (12,400 vs. 11,442 kg; $P < 0.01$) but had more days open (163 vs. 112 d; $P < 0.01$). Transporting dairy cows after calving does not negatively affect productive and reproductive performance. Transporting dairy cows at less than 8 DIM had positive effects on production but increased days open.

Key Words: centralized calving facility, postpartum transport, performance

M267 Antibiotic resistance of *Escherichia coli* isolated from gastrointestinal tracts of dairy calves fed waste milk or milk replacer. Georgina Maynou[1], Anna Arís[1], Alex Bach*[1,2], Francesc Fàbregas[1], Alba Ferré[1], and Marta Terré[1], *[1]Institut de Recerca i Tecnologia Agroalimentàries, Caldes de Montbui, Spain, [2]Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain.*

The use of waste milk (WM) to feed calves is a common practice in dairy farms to avoid economical losses of milk disposal. The aim of this study was to determine whether there is an increase of antibiotic resistance patterns in *E. coli* isolated from feces of calves fed either WM or milk replacer (MR). Fecal swabs were collected from 20 ± 5 calves at 6 wk of age from 8 dairy farms. In 4 farms, calves were fed MR and in the other 4 they received WM. Fecal swabs were cultured to obtain 5 *E. coli* isolates per sample. Each colony was tested for its susceptibility to 9 antibiotics by disk diffusion. Binomial logistic regressions were used to analyze the resistance of *E. coli* isolates for each calf and for each antimicrobial agent tested. Feeding practice (MR or WM) and the use in the farm of the antibiotic tested (as a disease treatment) were the fixed effects of the model, and farm the random effect. Multidrug resistance profiles among *E. coli* isolates were described by cluster analyses using the Ward's minimum variance method. Then, a Chi-squared analysis was performed to assess the distribution of *E. coli* isolates in each of the 6 clusters defined within the 2 milk-feeding practices. The probability of streptomycin (STR) resistant *E. coli* isolates was greater ($P < 0.05$) in calves fed WM than in those fed MR, but the use of STR in the farm did not affect the incidence of *E. coli* resistance. The number of *E. coli* resistant to enrofloxacin (ENR) isolated from calves fed WM tended ($P = 0.08$) to be greater than that from calves fed MR, and the use of ENR in the farm did not affect the incidence of *E. coli* resistance either. Most colonies isolated (93.9%) were included in 2 of the 6 clusters defined: 1 cluster included resistant *E. coli* isolates to 1 antibiotic and the other, resistant *E. coli* isolates to 3 antibiotics. The percentage of *E. coli* isolates within the most resistance cluster was greater ($P < 0.001$) for WM treatment than for MR. It is concluded that feeding calves WM increases the presence of antimicrobial resistance in fecal *E. coli.*

Key Words: antibiotic resistance, dairy calf, waste milk

M268 Effect of feeding calves waste milk on antibiotic resistance patterns of fecal *Escherichia coli*. Georgina Maynou[1], David Ziegler*[3], Hugh Chester-Jones[3], Alex Bach[2,1], and Marta Terré[1], *[1]Institut de Recerca i Tecnologia Agroalimentàries, Caldes de Montbui, Spain, [2]Southern Research and Outreach Center, Waseca, MN, United States, [3]Institució Catalana de Recerca i Estudis Avançats, Barcelona, Spain.*

The use of waste milk in a calf feeding program is suspected to contribute to the development of bacterial antimicrobial resistance. Fifty-two calves allocated in individual pens were randomly assigned to milk replacer (MR) or pasteurized waste milk (pWM) fed twice daily for 42 d and once daily from d 43 to weaning (49 d). Waste milk was picked up from a local dairy farm twice weekly during the study and tested for detection of β-lactam antibiotic class from each load of milk. Fecal swabs were taken from each calf at 5 and 8 wk of age and cultured to obtain 3 *E. coli* isolates per sample. Each colony was tested for its susceptibility to 12 antibiotics by disk diffusion. Feeding practice (MR or pWM) and age (5 or 8 wk) effect on *E. coli* antimicrobial resistance were analyzed using binary logistic regressions for each antibiotic tested. Feeding practice, calf age and interaction between treatment and age were the fixed effects of the model, calf the random effect and calf age the repeated. β-lactam antibiotic residues were detected from each pWM load. Calves fed pWM had greater probability ($P < 0.05$) to have ampicillin (AMP) and cephalothin (KF) (β-lactam antibiotics) resistant *E. coli* than calves fed MR, whereas the number of *E. coli* resistant to florfenicol tended *(P* = 0.07) to be greater in calves fed pWM than in those fed MR. However, the probability of isolating *E. coli* resistant to AMP and KF tended ($P = 0.11$; $P = 0.06$) to decrease in pWM from 5 to 8 wk of age, in contrast to MR calves that had similar probability of isolating *E. coli* resistant to AMP and KF from 5 to 8 wk of age. It is concluded that treating cows with antibiotics generates antimicrobial residues in milk and feeding calves pWM triggers the presence of resistant *E. coli* in the gut of dairy calves.

Key Words: antibiotic resistance, *E. coli*, pasteurized waste milk

M269 Fatty acid profile of bulk milk samples in commercial dairy herds in Quebec, Canada. Melissa Duplessis*, Debora E. Santschi, Rene Lacroix, and Daniel M. Lefebvre, *Valacta, Ste-Anne-de-Bellevue, QC, Canada.*

Consumer awareness of the potential health issues related to the consumption of saturated fats has increased over the past years. As milk fat contains more saturated fats than most plant oils, the effect of milk and dairy product consumption on human health has been questioned. The objective of this trial was to provide an assessment of the current

fatty acid (FA) profile, especially saturated FA, of bulk milk from 3 breeds [Holstein (HO), Jersey (JE), and Brown Swiss (BS)] in Quebec, Canada. Every wk from August 2014 to February 2015, milk samples (n = 97,999) from the bulk tank of 4,026 dairy herds were collected and sent to the Valacta laboratory (Ste-Anne-de-Bellevue, QC, Canada) for analysis. Milk fat and FA contents were determined using Fourier transform infrared spectroscopy. Data were analyzed using the MIXED and SQL procedures of SAS. As expected, bulk milk from JE had the highest milk fat content (5.24%) followed by bulk milk from BS (4.42%) and HO (4.15%; $P < 0.0001$). Table 1 shows that bulk milk FA profile differs between the 3 studied breeds; milk from JE herds had the highest content of saturated FA and the lowest content of polyunsaturated FA. Saturated FA content in bulk milk increased from August to February, varying from 64.66 in August to 67.11 g/100 g of total FA in February ($P < 0.0001$). Significant variation among herds was also observed ($P < 0.0001$), with saturated FA ranging from 51.18 to 76.28 g/100 of total FA. These results suggest that bulk milk FA profile varies according to breed, sampling month, and herd.

Table 1 (Abstr. M269). Milk fatty acid (FA) profile in bulk milk of 3 breeds (g/100 g of total FA; least squares means ± SEM)

Item	HO	JE	BS	*P*-value
C16:0	34.50 ± 0.01	35.12 ± 0.06	32.93 ± 0.10	<0.0001
C18:0	13.01 ± 0.00	13.11 ± 0.02	13.88 ± 0.04	<0.0001
C18:1	31.07 ± 0.01	28.00 ± 0.06	30.00 ± 0.10	<0.0001
Short-chain FA	9.62 ± 0.00	11.12 ± 0.02	10.74 ± 0.03	<0.0001
Medium-chain FA	43.75 ± 0.01	48.91 ± 0.11	46.00 ± 0.18	<0.0001
Long-chain FA	39.97 ± 0.01	36.90 ± 0.07	40.26 ± 0.12	<0.0001
Saturated FA	66.05 ± 0.01	69.36 ± 0.07	65.64 ± 0.12	<0.0001
Unsaturated FA	29.76 ± 0.01	27.77 ± 0.06	30.73 ± 0.11	<0.0001
Polyunsaturated FA	8.38 ± 0.00	7.43 ± 0.02	8.40 ± 0.03	<0.0001

Key Words: fatty acid profile, milk, cow

M270 Determination of β-hydroxybutyrate concentration in hand-stripped milk samples taken at different times relative to milking. Melissa Duplessis*, Debora E. Santschi, Jean Durocher, and Daniel M. Lefebvre, *Valacta, Ste-Anne-de-Bellevue, QC, Canada.*

Analyzing β-hydroxybutyrate (BHBA) concentration in Dairy Herd Improvement (DHI) milk samples is a practical tool to determine incidence of hyperketonemia (HKET) in dairy herds. The objective of this trial was to determine BHBA concentration from hand-stripped milk samples outside DHI milking tests to assess HKET. A total of 31 cows with 90 d in milk or less in 3 herds was involved. Milk samples were taken just before, during and right after the morning milking and at 2, 4, 6, and 9 h after milking. Samples during milking were collected using approved metering devices used for DHI tests. Other milk samples were obtained by hand from one or several quarters. All samples were sent to the Valacta laboratory (Ste-Anne-de-Bellevue, QC, Canada). Two analytical methods were used to analyze BHBA concentration in milk, i.e., the Fourier transform infrared (FTIR) spectroscopy and the continuous flow analyzer (Skalar; which is the reference method used to calibrate FTIR). Threshold used to determine HKET was ≥0.20 mmol BHBA/L. Data were analyzed with the Glimmix and Corr procedures of SAS. A significant analytical method × time relative to milking interaction was noted on the incidence of HKET ($P = 0.0004$). Incidence of HKET differed in the samples taken right after milking ($P = 0.006$) and 2 h after milking ($P = 0.10$) between the analytical methods whereas no difference was noted for other times relative to milking ($P \geq 0.13$). Indeed, incidence of HKET was 25.8 ± 7.8% and 29.0 ± 8.0% for Skalar and 61.3 ± 8.7% and 70.0 ± 5.0% for FTIR right after and 2 h after the milking, respectively. Pearson correlation coefficient between Skalar and FTIR BHBA results was 0.95 for the samples collected during milking and was lower for other times relative to milking (ranging from 0.6 to 0.9). In conclusion, BHBA concentration in milk is a practical tool to assess HKET, especially for milk samples taken during DHI tests. Hand-stripped milk samples collected right after or 2 h after milking require further calibration of FTIR before recommending BHBA concentration analysis.

Key Words: hyperketonemia, β-hydroxybutyrate, dairy cow

M271 Prevalence of *Salmonella* and *Campylobacter* from composite fecal samples on US dairy operations. Charles P. Fossler[1], Jason E. Lombard*[1], Paula J. Fedorka-Cray[2,3], Jodie R. Plumblee[2], Christine A. Kopral[1], and R. Camilla Kristensen[1], *[1]USDA:APHIS:VS: Center for Epidemiology and Animal Health, Fort Collins, CO, [2]USDA:ARS:Bacterial Epidemiology and Antimicrobial Resistance Research Unit, Athens, GA, [3]North Carolina State University, Raleigh, NC.*

During the National Animal Health Monitoring System's Dairy 2014 study, 6 composite environmental fecal samples were collected from 234 operations for culture of *Salmonella*. On 232 of the 234 operations, these samples were also tested for *Campylobacter*. One objective of the study was to estimate the herd-level prevalence of *Salmonella* and *Campylobacter* on US dairy operations. Samples were collected from March through July 2014. Estimates incorporated weighting procedures and were adjusted for study design. *Salmonella* was identified via culture from at least one sample on 39.2% of operations. Operations with 500 or more cows were more likely to be *Salmonella*-positive compared with operations with 30–99 cows (62.0% vs. 26.0%). No regional differences were observed in the percentage of *Salmonella*-positive operations. The largest percentages of *Salmonella*-positive samples were from manure pits (39.9%) and common alleyways (38.2%), while the lowest percentage positive were from gutter cleaners (23.9%); however, these percentages were not statistically different. Statistically, the percentage of *Salmonella*-positive operations from the Dairy 2014 study (39.2%) was not different from the percentage of *Salmonella*-positive operations from the NAHMS Dairy 2007 study (35.8%). *Campylobacter* was identified in at least one sample from 88.5% of operations. There were no differences by herd size or by region in the percentage of operations testing *Campylobacter*-positive. Overall, 54.8% of samples from holding pen floors were *Campylobacter*-positive, followed by 54.3% of samples from common alleyways, 51.1% from parlor exits, 45.5% from gutter cleaners, and 42.6% from common pens, and these locations were more likely to be positive than samples from manure spreaders (19.1%) and flush water (14.0%). A high percentage of US dairy operations can be expected to have *Campylobacter* on the operation. *Salmonella* is not as common, with less than half of operations expected to be positive at a single sampling. The percentage of operations positive for *Salmonella* did not change between the Dairy 2007 and Dairy 2014 studies.

Key Words: *Salmonella*, *Campylobacter*, prevalence

M272 Off-site dairy heifer rearing in the United States. Jason E. Lombard*[1], Ashley E. Adams[1,2], Charles P. Fossler[1], Natalie J. Urie[1,2], Chelsey B. Shivley[1,2], and Christine A. Kopral[1], *[1]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO, [2]Colorado State University, Fort Collins, CO.*

The National Animal Health Monitoring System′s Dairy 2014 study collected information regarding off-site rearing of dairy heifer calves. Data for the study were collected via face-to-face interviews on operations in the top 17 dairy states. An objective of the study was to describe the use of off-site heifer-rearing facilities by US dairy operations. Size categories were created based on adult cow populations: small (30–99 cows), medium (100–499 cows), and large (500 or more cows). The percentage of operations that had their heifers raised off-site increased as herd size increased: 5.5% of small, 11.9% of medium, and 44.2% of large operations. Overall 11.7% of operations raised heifers off-site. The majority of small and medium operations (84.9% and 59.0% percent, respectively) sent weaned and non-pregnant heifers to off-site rearing facilities at an average age of 255.4 and 164.7 d, respectively. The majority of large operations (62.8%) sent heifers to off-site facilities as preweaned heifers at an average age of 6.8 d. About a quarter of operations that sent the majority of calves off-site as preweaned heifers (26.6%), provided waste milk to the off-site rearing operation. Additionally, 2-thirds of the rearing facilities (66.8%) fed pasteurized waste milk. More than 4-fifths of operations (84.6%) used off-site rearing facilities within 50 miles of the dairy operation. Approximately 50% of operations in each size category and 53.8% of all operations sent heifers to a single facility where heifers had contact with cattle from other operations. Additionally, 10.6% of operations sent heifers to multiple facilities where they had contact with cattle from other operations. Most operations (69.6%) brought back pregnant heifers at an average age of 21.5 mo. Off-site heifer rearing is an important component of the US dairy industry; however, off-site rearing increases the potential for disease exposure and spread. The development of biosecurity/biocontainment plans based on specific risks associated with stress from shipping and exposure of dairy heifers to cattle from other operations at off-site facilities should reduce disease transmission.

Key Words: off-site heifer rearing, biosecurity, dairy heifer

M273 Management practices that may affect dairy heifer welfare on US dairy operations. Ashley E. Adams*[1,2], Jason E. Lombard[2], Chelsey S. Shivley[1,2], Natalie J. Urie[1,2], Ivette N. Roman-Muniz[1], Charles P. Fossler[2], and Christine A. Kopral[2], *[1]Colorado State University, Fort Collins, CO, [2]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO.*

The objectives of this study were to describe housing and management practices that may affect dairy heifer welfare on US dairy operations, and to compare dairy heifer housing and management practices on organic and non-organic dairy operations. This study was conducted as part of the National Animal Health Monitoring System's Dairy 2014 study, which included dairy operations in 17 states. Data on housing and management practices were collected on 1,261 dairy operations via in-person interviews. A total of 7.4% of operations were certified organic. Organic and non-organic operations differed only in the time at which calves were removed from the dam. On 50.1% of organic operations calves remained with their dam for 12 or more hours, compared with 26.9% of non-organic operations that kept calves with their dams for that long. Individual hutch/pen was the primary housing type for preweaned heifers on 69.6% of operations in 2013 compared with 74.9% of operations in 2006. Most dairy operations (94.3%) disbudded/dehorned calves. A hot iron was the most prevalent method used to disbud/dehorn calves (69.9%); 30.0% of operations that disbudded/dehorned calves gave the calves analgesics and/or anesthetics. Tail-docking was performed on 31.7% of operations, of which 1.1% used analgesia/anesthesia. A band was the most common method of tail-docking (97.0% of operations that tail-docked); 31.9% of operations that tail-docked, docked tails when heifers were less than 2 mo of age, while 44.9% tail-docked when heifers were over 2 years of age. In total, 6.4% of preweaned dairy heifers and 1.9% of weaned dairy heifers died during 2013, compared with 7.8% of preweaned heifers and 1.8% of weaned heifers in 2006. Of preweaned heifers and weaned heifers that died in 2013, 3.5% and 4.2%, respectively, were euthanized. The percentage of operations using an analgesia/anesthesia during disbudding/dehorning increased from 13.8% in 2006 to 30.0% in 2013; however, 70% of dairy operations do not use analgesia/anesthesia when disbudding/dehorning cows, which highlights the need for education regarding pain management during surgical procedures.

Key Words: dairy heifer, welfare, organic

M274 Management practices that may affect dairy cow welfare on US dairy operations. Ashley E. Adams*[1,2], Jason E. Lombard[2], Ivette N. Roman-Muniz[1], Charles P. Fossler[2], and Christine A. Kopral[2], *[1]Colorado State University, Fort Collins, CO, [2]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO.*

The objectives of this study were to describe housing and management practices that may affect dairy cow welfare on US dairy operations, and to compare dairy cow housing and management practices on organic (ORG) and non-organic (NORG) dairy operations. This study was conducted as part of the National Animal Health Monitoring System's Dairy 2014 study, which included data from dairy operations in 17 states. Data on housing and management practices were collected on 1,261 dairy operations via in-person interviews. A total of 7.4% of operations were certified organic. Freestall barns were the primary housing type for lactating cows on 39.0% of operations, while tie-stall or stanchion barns were used on 38.2%. The primary bedding material used in operations with freestall barns were sand (44.0%), sawdust (19.0%), and straw (14.2%). Operations with tie-stall or stanchion barns primarily used straw for bedding (46.4%) or saw dust (25.3%). For organic operations, the predominant flooring types for cows not being milked were concrete (45.0%), pasture (31.1%), and rubber mats over concrete (14.9%). In comparison, the predominant flooring types used on NORG operations were concrete (62.2%) and rubber mats over concrete (21.8%). Fans for cooling dairy cows were used on 59.6% of ORG operations and 77.0% of NORG operations. Sprinklers/misters were used on 12.1% of ORG and 26.3% of NORG operations. A total of 59.8% of operations provided personnel with training in milking procedures, 56.0% in animal handling, 33.4% in management of nonambulatory cattle, 29.8% in surgical procedures, and 20% in euthanasia. In total, 5.6% of dairy cows died during 2013, of which 40.6% were euthanized. While a smaller percentage of ORG operations used concrete as the primary flooring for dairy cows, more NORG operations provided heat abatement, suggesting that there is room to improve cow welfare on both types of operations. This finding is also evidenced by the percentage of dairies that do not train personnel in animal handling, surgical procedures, management of nonambulatory cattle, and euthanasia techniques, all of which may affect dairy cow welfare.

Key Words: dairy cow, welfare, organic

M275 Evaluation of colostrum management, feeding management, and weaning practices on US dairy operations. Chelsey B. Shivley*[1,2], Jason E. Lombard[2], Ashley E. Adams[1,2], Natalie J. Urie[1,2], Charles P. Fossler[2], and Christine A. Kopral[2], *[1]Colorado State University, Fort Collins, CO, [2]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO.*

The National Animal Health Monitoring System's Dairy 2014 study evaluated colostrum management, feeding management, and weaning practices on 1,261 operations from 17 of the nation's top dairy states. Results from the study indicate that on average heifer calves were given their first feeding of colostrum 3.6 h following birth. The highest percentage of operations (53.2%) administered colostrum by hand, followed by both hand-feeding and suckling the cow (40.5%), and only suckling the cow (6.3%). For the 93.7% of operations that hand-fed colostrum, 87.4% fed colostrum with a bottle, 8.1% with an esophageal feeder, and 4.5% with a bucket. Most dairies (53.0%) fed 2 L of colostrum at the first feeding, and 62.1% of operations fed another 2 L within the first 24 h following birth. About half of all operations (49.3%) stored colostrum, with freezing being the most common method of storage (73.0% of operations). About half of dairies that hand-fed colostrum (53.3%) estimated colostrum quality, with visual appearance being the most common method used (45.1% of operations). Only 6.2% of operations monitored serum proteins to test passive-transfer status. Almost half of dairies (49.9%) fed milk replacer (MR), and 63.2% fed waste milk. Of operations that fed MR, percent protein was 20–24% on 89.2% of operations. About half of operations (56.4%) fed less than 4.7 L of waste milk or MR per day, with most operations (94.6%) feeding twice per day. The highest percentage of operations used bottles and buckets to feed waste milk or MR (77.2% and 72.3%, respectively). On average, heifer calves were first offered water at 17.3 d of age, starter grain at 10.8 d of age, and hay at 36.0 d of age. The average age at weaning was 8.8 weeks, and age was the most commonly used determinant for weaning on 50.2% of operations. These results show that less than 2 thirds of producers are feeding the recommended 3–4 L of colostrum at the first feeding on US dairies, indicating that producer education on colostrum management is warranted.

Key Words: dairy heifer calves, colostrum management, feeding management

M276 Locomotion scoring dairy cows: A comparison among three different locomotion scoring on intra- and interrater reliability. Ashley E. Adams*[1,2], Jason E. Lombard[2], and Ivette N. Roman-Muniz[1], *[1]Colorado State University, Fort Collins, CO, [2]USDA:APHIS:VS:Center for Epidemiology and Animal Health, Fort Collins, CO.*

Lameness in dairy cattle is usually identified by judging the locomotion of dairy cows. The objective of this study was to determine differences in intra- and interrater reliability among 3 different locomotion scoring systems for dairy cows. The 3-, 4-, and 5-point locomotion scoring systems were used by 42 observers to score the gait of cows in a set of 45 video clips. Each observer scored the set of clips 4 times, once using each of the 3 scoring systems, then again repeating one of the 3 systems. The order of presentation of the video clips was randomized between each viewing, and participants were randomly assigned to repeat one of the 3 scoring systems. Intra- and interrater reliability were calculated as the weighted kappa coefficient (κw). The mean intrarater reliability for the 3-point system was κw = 0.57 (95% CI: 0.43–0.71), for the 4-point system κw = 0.60 (95% CI: 0.53–0.68), and κw = 0.64 (95% CI: 0.55–0.72) for the 5-point system. The CI for intrarater reliability suggests that no difference exists in κw among the 3 systems. The mean interrater reliability for the 3-point system was κw = 0.42 (95% CI: 0.41–0.43), for the 4-point system κw = 0.43 (95% CI: 0.42–0.44), and κw = 0.47 (95% CI:0.46–0.48) for the 5-point system. These intervals indicate that interrater reliability is greater for the 5-point system when compared with the 3- and 4-point systems. Using a level of acceptable reliability of κw >0.60, none of the scoring systems achieved good reliability for interrater comparisons, while both the 4- and the 5-point scoring systems achieved good intrarater reliability. This result suggest that within observer reliability is adequate for the 4- and 5-point scoring systems, but not for the 3-point system. In contrast, between observer reliability is lacking for the 3 locomotion scoring systems examined in this study. Further analysis is needed to determine if cows are consistently identified as lame and severely lame using the 3 scoring systems.

Key Words: dairy cow, locomotion scoring, reliability

M277 Association between changes in body condition score, NEFA, and BHBA concentrations during the transition period on fertility of Holstein cows. R. V. Barletta*[1,2], P. D. Carvalho[1], M. Madureira[3], T. A. Del Vale[2], E. R. Madureira[3], A. S. Netto[2], G. M. Baez[1], P. M. Fricke[1], and M. C. Wiltbank[1], *[1]Department of Dairy Science, University of Wisconsin-Madison, Madison, WI, [2]Department of Nutrition and Animal Production, School of Veterinary Medicine and Animal Sciences, University of São Paulo, São Paulo, Brazil, [3]Department of Animal Reproduction, School of Veterinary Medicine and Animal Sciences, University of São Paulo, São Paulo, Brazil.*

Our objective was to assess the association between body condition score (BCS) change during the transition period with pregnancies per AI (P/AI) and NEFA and BHBA concentrations in Holstein cows in a retrospective cohort study. Holstein cows (n = 232) were assessed for BCS (5 point scale; 0.25 point increments) at 21 d before, on the day of, and 21 d after calving. Blood samples were collected 21 and 7 d before, on the day of, and 7 and 21 d after calving and were assayed for NEFA and BHBA concentrations. All cows received a timed artificial insemination (TAI) after a Presynch-Ovsynch protocol at 75 ± 3 DIM. Data were analyzed by logistic regression with GLIMMIX and ANOVA with repeated measures using the MIXED procedures of SAS. Both NEFA and BHBA concentrations after calving differed ($P < 0.01$) for cows that lost, maintained, or gained BCS from 21 d before to 21 d after calving (NEFA: 0.49 ± 0.01; 0.40 ± 0.01; 0.43 ± 0.01 mmol/L; BHBA: 0.72 ± 0.02; 0.70 ± 0.02; 0.67 ± 0.02 mmol/L; respectively). Day of sampling relative to calving also affected ($P < 0.01$) NEFA and BHBA concentrations, with the greatest increase occurring 7 d after calving. Change in BCS after ($P < 0.01$) but not before calving affected P/AI. Cows were grouped based on BCS change after calving as to whether they: 1) lost, 2) maintained, or 3) gained BCS. By design, BCS change after calving differed ($P < 0.01$) among groups and was −0.38; 0.00; and 0.35 for cows in groups 1, 2 and 3, respectively. On the day of calving, BCS differed ($P < 0.01$) among groups and was 2.89; 2.69; and 2.49 for cows in groups 1, 2 and 3, respectively. At 21 d after calving, BCS differed ($P < 0.01$) among groups and was 2.51; 2.69; and 2.85 for cows in groups 1, 2 and 3, respectively. At 32 d after TAI, P/AI differed ($P < 0.01$) for cows that lost [13% (11/84)], maintained [33% (26/80)], or gained [47% (32/68)] BCS. In conclusion, changes in BCS during the transition period affected NEFA and BHBA concentrations during the transition period; however, P/AI was only affected by changes in BCS after calving.

Key Words: body condition score, fertility, transition period

M278 Compost bedded pack on bacterial counts and milk composition in lactating dairy cows. Lorena Castillejos, María Rodríguez, Adriana Siurana, and Sergio Calsamiglia*, *Animal Nutrition and Welfare Service, Department of Animal and Food Science, Universitat Autònoma de Barcelona, Bellaterra, Spain.*

The compost bedded pack dairy barn is an alternative loose housing system that has been implemented in the recent years. The objective of this study was to evaluate the effect of compost bedded pack on bacterial counts in bedding and milk in lactating dairy cows. A field study was conducted in Girona (Spain) between May 2013 and July 2014 in 2 commercial dairy farms (816 and 394 lactating cows). Cows were distributed in equal barns (90 ± 14 and 66 ± 7 cows) with different loose housing system: 2 compost-bedded-pack (compost) barns were compared with 2 conventional-bedded-pack (control) barns, 4 barns per farm. Compost barns were aerated twice daily, but less sawdust was added as bedding material. Farms were visited 6 times (spring, summer and autumn of 2013 and winter, spring and summer of 2014). During each visit, bedding material samples throughout each barn and milk samples of the total production of each barn of the morning and afternoon milking were collected. Data on milk composition (lactose, protein, fat and fat free total solids) and somatic cells count (SCC) were analyzed. Bacterial counts of bedding material were determined for mesophilic aerobic bacteria (total bacteria counts, TBC), other gram-negative, total coliforms, *E. coli*, *Streptococcus* spp., *Strep. agalactiae*, and *Klebsiella* spp. Bacterial counts of milk were determined for TBC, other gram-negative, lactose (-), total coliforms, *E. coli*, coagulase-negative staphylococci, *Staph. aureus*, *Streptococcus* spp., *Strep. agalactiae*, and *Klebsiella* spp. No significant effects in bacterial counts were found in bedding material (TBC $1.1 \times 10^{10} \pm 3.3 \times 10^{9}$ cfu/g) or milk (TBC $5.1 \times 10^{4} \pm 9.3 \times 10^{3}$ cfu/mL). Milk quality (SCC 240,000 ± 173,000 cells/mL) and composition did not change, except for lactose that was higher in compost cows than in control cows (4.91 vs 4.89 ± 0.008%, $P < 0.05$). These results suggest that udder health and milk quality were not compromised when housing lactating dairy cows were in compost barns. Saving of sawdust and manure storage costs without negative effect in milk quality, encourage the implementation of compost barns in dairy farms.

Key Words: compost bedded pack barn, bacterial count, milk composition

M279 Economic impact of nutritional grouping in dairy herds. Afshin S. Kalantari*, Louis E. Armentano, Randy D. Shaver, and Victor E. Cabrera, *University of Wisconsin-Madison, Madison, WI.*

Study's objective was to evaluate the economic impact of nutritional grouping in commercial dairy herds. A dynamic, stochastic Monte Carlo simulation model was developed to represent individual cow DMI, NE_L, and MP requirements and the resulting changes in body energy throughout a year. The amount of energy consumed directly affected the BW and BCS changes in the model. Moreover, to control the range of observed BCS in the model constraints on lower and upper bounds of BCS were set. Cows that would drop to BCS <2.0 were assumed to stay at BCS = 2.0, but at a decreased milk production {New daily milk (kg/d) = daily milk (kg/d) – [deficient NE_L intake (Mcal/d)/NE_L in milk (Mcal/kg)]}, and cows that would reach BCS >4.5 were assumed to stay at BCS = 4.5, but at decreased DMI {New DMI (kg/d) = DMI (kg/d) – [extra NE_L intake (Mcal/d)/dietary NE_L (Mcal/kg)]}. The model was validated by comparing its projections against actual data regarding involuntary culling, BW, BCS, NE_L and MP concentrations of the offered diet. The model was initialized by separate data sets obtained from 5 dairy herds with different herd size and structure. Status of each cow was updated on a daily basis together with the required diet nutrient concentrations. Each month, lactating cows were regrouped according to the studied grouping strategies and their nutrient concentration requirements. The calculated income over feed costs (IOFC, $/cow per yr) of having more than 1 nutritional group among the herds ranged from $51 to $70, with an average of $58 for 2 groups and $70 for 3 groups, when group was fed at average NE_L and average+1xSD MP concentration. The improved IOFC was explained by increased milk sales and lower feed costs. Higher milk sales were a result of fewer cows having a milk loss associated with low BCS in multi-group scenarios. Lower feed costs in multi-group scenarios were mainly due to less RUP consumption. The percentage of total NE_L consumed captured in milk for greater than 1 nutritional group did not show a consistent increase and the values were rather similar among different group numbers. The percentage of N fed that was captured in milk increased with more than 1 group, and was the most important factor for improved economic efficiency of the grouping strategies.

Key Words: stochastic, simulation, nutrition

M280 Influence of calving weight on milk yield of dairy Gyr cows. Manuela Pires Monteiro Gama*[1], Gabriela Geraldi Mendonça[2], Anibal Eugênio Vercesi Filho[3], André Rabelo[4], Lenira El Faro Zadra[3], and Cláudia Cristina Paro Paz[1,3], *[1]Departamento de Genética, FMRP-USP, Ribeirão Preto, SP, Brazil, [2]Instituto de Zootecnia (IZ/APTA/SAA), Nova Odessa, SP, Brazil, [3]Centro APTA Bovinos de Corte, Instituto de Zootecnia (IZ), Sertãozinho, SP, Brazil, [4]ABCGIL – Associação Brasileira de Criadores de Gir Leiteiro, Uberaba, MG, Brazil.*

The weight of cows at calving is not a trait commonly measured by producers, but may influence milk yield and reproduction because of the negative energy balance. The effect of calving weight on milk yield of dairy Gyr cows was analyzed using data from 2 herds comprising 570 records of total yield during lactation of 363 cows that had calved between 2000 and 2014. The contemporary groups containing at least 5 observations were defined as herd and year and season of calving. The latter was divided into dry season (April to September) and rainy season (October to March). The analyses were performed using linear models containing the fixed effects of contemporary group and lactation duration (linear coefficient), and by regression of milk yield on calving weight nested within classes of age at calving (1 to 8), with class 1 corresponding to animals aged 2 to 3 years and so on until animals aged 10 years at calving. The PROC GLM module of the SAS program was used for analysis. The mean calving weight was 434.156 kg and this trait was influenced by age of cow at calving (linear and quadratic effects). The trend of regression indicated an increase in calving weight up to 90 mo, declining thereafter. The effect of calving weight for each class of age at calving presented linear regression coefficients of 5.19, 7.34, 9.33, 8.97, 2.43, −0.93, −3.70 and −4.97, respectively. These results demonstrate an increase in calving weight and total yield until physiological maturity, which occurs in this breed at about 93 mo when production starts to decrease slowly with increasing age of the animal. The influence of calving weight on milk yield is more important for younger cows. This importance decreases for older cows as expected, since they have stopped growing and have reached their maximum genetic production potential. Furthermore, older cows produce less milk compared with younger animals whose genetic potential for milk production and lactation persistence is higher due to the genetic improvement performed.

Key Words: body weight, Zebu, age at calving

M281 Effects of dietary forage and protein levels on the concentration and total load of *Escherichia coli* and *Listeria monocytogenes* in feces of dairy cows. M. Niu*[1], S. Biswas[2], J. A. D. R.N. Appuhamy[1], P. K. Pandey[2], A. Leytem[3], R. Dungan[3], and E. Kebreab[1], *[1]Department of Animal Science, University of California, Davis, Davis, CA, [2]Department of Population Health and Reproduction, University of California, Davis, Davis, CA, [3]USDA-ARS, Northwest Irrigation and Soils Research Lab, Kimberly, ID.*

Escherichia coli and *Listeria monocytogenes* are animal waste borne pathogens. The study aimed to determine if the basic dietary nutrient composition affected total *E. coli* and *Listeria* load and concentration in dairy cow feces. Twelve Holstein cows were assigned to a 2 × 2 factorial arrangement of 2 forage levels [37 (LF) vs. 53% (HF)] and 2 CP levels [15.2 (LP) vs. 18.5% (HP)] in a 4 × 4 Latin square design with 4 periods. After a 14 d adaptation period, total feces mass (kg/cow/d) was determined using total collection approach for 3 d. Six fecal samples were collected periodically to represent the course of a day. Dry matter intake (kg/cow/d), and *E. coli* and *Listeria* concentrations in all feed ingredients were measured to determine pathogen intake via feed. Pathogen concentrations in solid samples were determined as colony forming units (cfu) per gram according to the Bacteriological Analytical Manual recommended by US FDA. Total pathogen load was calculated based on the pathogen concentration and feces mass. Treatment effects were analyzed by a mixed model with the random effect of cow. Concentration of *E. coli* and *Listeria* were measured for all feed ingredients. Estimated average *E. coli* and *Listeria* concentrations in LF and HF diets were 1.4×10^6 and 1.9×10^6, and 3.8×10^4 and 5.4×10^4 cfu/kg of DM, respectively. Interaction effects between dietary fiber and CP contents were found for both *E.coli* concentration ($P < 0.05$) and load ($P < 0.01$) in feces. Fecal *E. coli* concentration and load were greater ($P < 0.05$) in HFHP (5.4×10^6 cfu/g and 6.4×10^{10} cfu, respectively) than HFLP (3.1×10^6 cfu/g and 3.64×10^{10} cfu, respectively). Greater dietary CP content significantly decreased fecal concentration of *Listeria* regardless of dietary fiber content ($P < 0.01$). Concentration of *Listeria* was higher in LP (110.5 cfu/g) than HP (68.2 cfu/g). There was no association between DM, CP, NDF, or starch of feces and *E. coli* or *Listeria*. Dietary forage and CP interactively affect the concentration and total load of *E. coli.* Only dietary CP level affects concentration of *Listeria* in the feces of dairy cows.

Key Words: dairy cow, *E. coli*, *Listeria*

M282 Urinary disposition kinetics and fecal excretion of two intramammary antibiotic preparations in dairy cows. Partha Pratim Ray*, Katharine F. Knowlton, Chao Shang, and Kang Xia, *Virginia Polytechnic Institute and State University, Blacksburg, VA.*

Appropriate assessment of the contribution of antibiotic use in animal agriculture to development of antibiotic resistance in bacterial pathogens and development of efficient mitigation strategies are limited due to a lack of data on the elimination of antibiotics from animals. The objective was to investigate urinary disposition kinetics and fecal excretion of pirlimycin and cephapirin, 2 antibiotics commonly used on dairy farms as intramammary infusion. Three lactating cows were administered 2 doses of pirlimycin (50 mg/cow; 24 h apart), and 3 end of lactation dairy cows were administered cephapirin (1200 mg/cow) intramammary. Feces and urine were collected just before antibiotic infusion and at 2, 4, 8, 12, 16, and 24 h after 1st dose of pirlimycin, at 2, 4, 8, 12, 16, 24, 36, 48, and 72 h after 2nd dose of pirlimycin, and at 2, 4, 8, 12, 16, 24, 36, and 72 h post-cephapirin infusion. Antibiotics were quantified using UPLC-MS/MS. Urinary disposition kinetics parameters were derived by fitting urine concentration-time data into noncompartmental model. Elimination rate constants in urine were estimated using regression analyses of antibiotic concentrations after peak time. The elimination half-life, mean residence time, and elimination rate constant for 1st and 2nd dose of pirlimycin and cephapirin were 11.6 ± 3.6, 20.2 ± 8.8, and 14.9 ± 1.9 h, 22.1 ± 9.3, 33.1 ± 14.5, and 25.2 ± 4.9 h, and 0.039 ± 0.034, 0.038 ± 0.016, and 0.048 ± 0.006 h^{-1}, respectively. Fecal concentration of pirlimycin peaked (252 ± 162 ng/g) at 34.9 ± 9.2 h after the 2nd dose. Despite intramammary administration, antibiotics reached blood and the digestive tract, were excreted in urine and feces, and thus may influence microbial antibiotic resistance in the gut and following excretion. Slow elimination and long residence time of antibiotics indicate that manure may need to be treated to reduce antibiotic loading to the environment. The data obtained in this study will allow development of efficient manure management strategies to reduce the contribution of dairy farms to the challenge of antibiotic resistance.

Key Words: dairy cow, disposition kinetics, intramammary antibiotic preparation

M283 Performance and health of Holstein calves fed different amounts of milk supply with or without a symbiotic complex. Marcos Inácio Marcondes[1], Juana Chagas[*1,2], Roberto D. Sainz[3], Thiago Pereira[1], and Evando Filgueiras[4], *[1]Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil, [2]Universidade Federal Rural de Pernambuco, Recife, Pernambuco, Brazil, [3]University of California, Davis, CA, [4]Bioformula Leite, Gioânia, Goiais, Brazil.*

The objective of this study was to evaluate performance and health of Holstein calves fed low or high milk supply (MSP) and with an inclusion or not of symbiotic complex (SYM). Thirty-two Holstein calves (34 ± 7 kg BW) with an age of 6 d were distributed in a randomized block design in a 2 × 2 factorial arrangement. The MSP consisted in: low MSP - 10% BW for the 1st through 8th weeks after birth; and high MSP - 20% BW for the 1st and 2nd weeks after birth, 15% BW for the 3rd and 4th weeks after birth and 10% BW for the 5th and 8th weeks after birth. The SYM tested was Bioformula Leite (prebiotics, probiotics, and fibrolytic enzymes). Solid ration was supplied in addition to milk. Intake, ADG, diet digestibility, and fecal consistency index were evaluated. MSP influenced calf growth ($P < 0.10$), with different final weight (77.8 and 85.0 kg), post-weaning average weight gain (548 and 788 g/d), and final average weight gain (549 and 646 g/d) in calves fed 10% and 20% BW, respectively. MSP affected intake variables; calves fed 10% and 20% BW had pre-weaning dry ration intakes of 291 and 237 g/d, pre-weaning total DM intake of 715 and 1,672 g/d, and total DM intakes over the experimental period of 867 and 1,016 g/d. The digestibility of DM, CP, NDF, and non-fiber carbohydrates were not different for both variables ($P > 0.10$): 0.73, 0.69, 0.77, and 0.92 g/kg, respectively. There was an interaction between MSP and SYM on the digestibility's of DM and NDF ($P < 0.10$). The digestibility of DM (0.728 g/kg) and NDF (0.771 g/kg) of the calves fed 10% BW were not affected by inclusion of SYM ($P > 0.10$). On the other hand, for calves fed 20% BW, inclusion of SYM increased digestibility of DM (0.720 to 0.736 g/kg) and NDF (0.758 to 0.783 g/kg). The use of SYM improved fecal score of the animals ($P < 0.10$; 0.31 and 0.42, respectively). The milk-feeding level is an important factor in animal performance. In addition, the present study demonstrated positive results for the DM and NDF digestibilities, and animal's health; Thereby SYM might be use as an option to control diarrhea.

Key Words: fecal score, milk supply, weaning

M284 Impact of feeding betaine-containing molasses to transition dairy cows during late summer. Ana Paula A. Monteiro*[1], John K. Bernard[1], Stephen Emanuele[2], Randy Davis[2], Charles R. Staples[3], Jundi Liu[1], Geoffrey E. Dahl[3], and Sha Tao[1], *[1]University of Georgia, Tifton, GA, [2]Quality Liquid Feeds, Dodgeville, WI, [3]University of Florida, Gainesville, FL.*

Betaine (tri-methyl glycine) is a natural compound found in sugar beets and serves as a methyl donor when fed to animals. Under heat stress it can act as an osmolyte, reducing dehydration. The objective was to evaluate the effect of feeding betaine-containing molasses on performance of transition dairy cows during late summer. In early September, cows were randomly assigned to betaine (B) or control (C) groups either at dry off (B: n = 10; C: n = 10) or 24 d before calving (B: n = 8; C: n = 8) based on their previous mature equivalent milk yield. Cows were fed a common diet supplemented either with a 28% CP molasses-based liquid supplement made from sugar cane or a 28% CP liquid supplement made of molasses from sugar cane (67%) and condensed beet solubles containing ~30% betaine (33%) for C and B cows, respectively, until 60 d in milk. The liquid supplement was fed at a rate of 1.1 and 1.4 kg DM/d for pre and postpartum cows, respectively. Before calving, all cows were housed in the same free-stall barn without supplemental cooling. After calving, all cows were cooled by misters and fans and were milked thrice daily. Feed intake was recorded daily and BW and BCS were assessed every 2 wk. Milk yield was recorded at each milking and composition was analyzed weekly. Blood samples were collected weekly from a subset of cows to assess hematocrit and concentrations of cortisol, betaine, and metabolites. There were no treatment effects on intake of DM and BW in the prepartum and postpartum periods, but cows fed B had lower ($P = 0.05$) BCS at 4 and 6 wk postpartum compared with C. For those cows enrolled at dry off, B tended to have lower ($P < 0.15$) hematocrit at 8 and 5 wk before calving compared with C, but no difference was detected postpartum. All cows fed B tended ($P < 0.10$) to produce more milk (44.2 vs. 41.5 kg/d) and 3.5% FCM (50.0 vs. 47.0 kg/d) compared with C, but no differences in milk composition were observed. In conclusion, supplementing transition cows with betaine-containing liquid supplement during late summer may prevent dehydration of dry cows based on a trend for lower hematocrit and increase 3.5% FCM yield in early lactation.

Key Words: dairy cow, heat stress, betaine

M285 Growth and behavior of group-fed dairy calves fed once or twice daily in an organic production system. Myrrh-Anna J. Kienitz*[1], Bradley J. Heins[1], and Hugh Chester-Jones[2], *[1]University of Minnesota, West Central Research and Outreach Center, Morris, MN, [2]University of Minnesota, Southern Research and Outreach Center, Waseca, MN.*

Heifer calves (n = 102) were used to evaluate the effect of once or twice daily feeding on growth and behavior of calves in an organic group management system. Calves were assigned to replicate feeding groups of 10 in super hutches by birth order, during 2 seasons from September to December 2013 and March to May 2014 at the University of Minnesota West Central Research and Outreach Center, Morris. Calves in groups were the experimental unit. Breed groups of calves were: Holsteins (HO; n = 26), crossbreds (n = 45) including combinations HO, Montbéliarde, and Viking Red selected for high production, and crossbreds (n = 31) including combinations of HO, Jersey, Normande, and Viking Red selected for robustness. Treatment groups were 1) once daily feeding (1×) or 2) twice daily feeding (2×). Calf groups were fed 6 L per calf/daily (2×, 3 L/feeding) of 13% total solids organic milk then weaned at 60 d when the group consumption averaged 0.91 kg starter/calf daily. Body weight and hip height were recorded at birth, once/wk, at weaning, and at 90 d of age. Hobo Pendant G loggers were applied to the right rear leg of calves to measure total lying and standing time. Data were analyzed using PROC MIXED of SAS. Independent variables for analyses were the fixed effects of birth weight (co-variable), season of birth, treatment group, along with replicate as a random effect. Weaning group performance was gain per day, 1× (0.79 kg) and 2× (0.81 kg; $P = 0.33$); weaning weight, 1× (92.7 kg) and 2× (93.3 kg; $P = 0.80$); and weaning hip height, 1× (95.2 cm), and 2× (95.3 cm; $P = 0.94$). Daily gain to 90 d were 0.85 vs. 0.85 kg, and daily gain to 120 d were 0.85 vs. 0.83 kg for 1× and 2× calves, respectively ($P = 0.62$). For lying time, 1× (988 min/d) and 2× (995 min/d) were not different ($P = 0.57$) from each other. During the evening hours, the 2× calves had lower ($P < 0.01$) lying times (34 min/h for 1×; 28 min/h for 2×) per h because they were fed at 6pm every evening. In summary, group-fed calves fed once per day in an organic production had similar average daily gains and body dimensions compared with calves fed twice per day.

Key Words: organic, calf growth, crossbreeding

M286 The sex ratio of female to male calves may be affected by number of services to achieve conception and lactation number of the lactating dairy cow. Andy Mendes*[1], Michael R. Murphy[2], Peter S. Erickson[3], and David P. Casper[1], *[1]South Dakota State University, Brookings, SD, [2]University of Illinois, Champaign Urbana, IL, [3]University of New Hampshire, Durham, NH.*

Commercial dairy producers get frustrated by the low ratio of female to male calves born because female calves are more valuable than bull calves. The objective of this data analysis was to determine if any parameters could be identified that may be influencing the ratio of female to male calves born on the dairy operation. Data from the University of Illinois and the University of New Hampshire Dairy herds were collected and summarized for calf sex, number of services to achieve conception, and lactation number of the lactating dairy cow when she conceived. Logistical regression procedures were used to analyze the data set via version 9.4 of SAS. The data set was edited to delete those cow observations when the number of services to achieve conception (n = 6) or lactation number (n = 2) were greater than 9. These cows would typically be classified as "do not breed" and sold for harvest. The final data set contained 2,987 calvings, which consisted of 1,406 females and 1,581 males (47.1 and 52.9% for females and males, respectively). The frequency distribution of number of services to achieve conception was highest for first service and progressively declined with increasing services (52.1, 21.7, 10.8, 6.7, 4.2 and 4.7% for 1 to 6 services, respectively). The frequency distribution of calvings by lactation number was highest for 1st lactation cows becoming pregnant with their 2nd calf and declined with increasing lactation number (35.5, 28.2, 17.0, 9.6, 5.0, 2.5, 1.1. 0.1 and 0.3% for lactation number 1 to 9, respectively). Logistic stepwise regression indicated that number of services to achieve conception was significant ($P < 0.02$) in predicting the ratio of female to male calves. Calculation of odds ratios indicated that as the lactation number increased the likelihood of getting a bull calf decreased. These data demonstrate that increasing number of services to achieve conception and age of the cow increase the probability of getting a heifer calf. The earlier in DIM or age a cow conceives will increase the odds of the dairy producer getting a male calf.

Key Words: female, male, sex ratio

M287 Margin over concentrates as a performance indicator for the dairy farms. Aadi Remmik*, *Estonian University of Life Sciences, Tartu, Estonia.*

Margin over concentrates (MoC) was identified as a practical indicator of management performance at dairy farms. It was found to be a more objective metric than income over feed costs (IOFC), yet it has been scarcely used in dairy farm management literature. Estonian University of Life Sciences and partner farmers conducted a study recording data on production processes in 10 midsize (190–750 milking cows) Estonian dairy farms on a monthly basis in 2012–2014. The study included detailed information on feeding and milk output. One of the key objectives of the study was to find reliable performance indicators that would assist dairy farmers in diagnosing and measuring potential weaknesses in farms' production processes. In the study, MoC was calculated as milk sales turnover less cost of concentrate feeds for the milking herd (including dry cows, but excluding youngstock). Concentrate feeds included all feeds except grass, silages (grass and corn), hay and straw. Concentrate feeds were determined the biggest single cost component at the farms (29% of all dairy-related costs on average) and its efficient use has a significant effect on total farm profitability. MoC was found to effectively summarize the financial result of several other metrics, such as milk yield, milk price, percentage of discarded milk, and so on. MoC excludes cost of forage feeds that often lack reliable market price and can have very different physical and nutritional characteristics based of preparation timing, plant material and technology. Dairy farmers could benefit from using MoC as a broad measurement tool for the milk herd performance.

Key Words: dairy, performance, measurement

M288 Factors affecting the success of an embryo transfer program in dairy cattle. Priscila Ferraz*[3], Clay Burnley[4], John Karanja[5], Achilles Vieira-Neto[1], Jose Eduardo P. Santos[1], and Klibs N. Galvão[2], *[1]Department of Animal Sciences, University of Florida, Gainesville, FL, [2]Department of Large Animal Clinical Sciences, University of Florida, Gainesville, FL, [3]Escola de Medicina Veterinaria, Universidade Federal da Bahia, Salvador, Bahia, Brazil, [4]Southern Embryo, Athens, GA, [5]North Florida Holsteins, Bell, FL.*

Objective of the study was to evaluate factors affecting pregnancy per embryo transfer (PET) in dairy cattle. A total of 10,634 transfers in 6,734 Holstein dairy cows (primiparous = 2,287; multiparous = 1,907) and heifers (n = 6,440) from a 4,500-cow commercial herd in Northern Florida, were used. Data on collection year (2011–2014), transfer season (fall, winter, spring, summer), semen type [conventional (C), sexed (S)], embryo type (Fresh, Frozen, IVF, IVF-Frozen), embryo developmental stage (4 - morula, 5 - early blastocyst, 6 - blastocyst, 7 - expanded blastocyst, 8 - hatched blastocyst), embryo quality grade (1 - excellent/good, 2 - fair, 3 - poor), recipient parity (N - nulliparous, P - primiparous, M - multiparous), recipient estrous cycle day (5, 6, 7, 8, 9), technician (1, 2, 3, 4), DIM, and milk yield at the time of transfer were collected. The embryos were produced in vivo (superstimulation and uterine flush 7 d after AI) or in vitro (ovum pick-up, fertilization, in vitro culture for 7 d). Pregnancy was diagnosed at 41 ± 3 d of gestation. Data were evaluated by mixed logistic regression using the GLIMMIX procedure of SAS using all data listed as fixed effects and recipient ID as random. PET was affected by embryo type (Fresh = 48.1%, Frozen = 36.6%, IVF = 38.9%, IVF-Frozen = 32.6%; $P < 0.001$), embryo stage (4 = 36.4%, 5 = 34.1%, 6 = 38.2%, 7 = 45.2%, 8 = 37.1%; $P < 0.001$), embryo quality (1 = 42.1%, 2 = 32.6%, 3 = 23.5%; $P < 0.001$), recipient parity (n = 41.9%, P = 37.7%, M = 31.6%; $P < 0.001$), recipient estrous cycle day (5 = 32.6%, 6 = 36.4%, 7 = 40.8%, 8 = 40.4%, 9 = 36.6%; $P < 0.001$), technician (1 = 33.9%, 2 = 33.5%, 3 = 38.0%, 4 = 43.8%; $P < 0.001$), semen type (C = 39.9%, S = 37.7%, $P = 0.03$), transfer year (2011 = 44.2%, 2012 = 41.5%, 2013 = 38.2%, 2014 = 36.5%, $P < 0.001$). In conclusion, PET was affected by year, semen type, embryo type, embryo stage and quality, recipient parity, recipient estrous cycle day, and technician, but not by transfer season, DIM or milk yield at embryo transfer.

Key Words: embryo transfer, pregnancy, dairy cattle

M289 High cow ration recipe: Preparation and feeding times. Yolanda Trillo*[1], Sonia Rodriguez[1], Alfonso Lago[2], and Noelia Silva-del-Rio[1], *[1]UC Davis School of Veterinary Medicine, VMTRC, Tulare, CA, [2]DairyExperts, Tulare, CA.*

The objective of this study was to describe the high cow ration (HCR) recipe preparation and feeding times on 26 California dairies ranging in size from 1,100 to 6,900 cows. Consecutive records from a 12-mo period were extracted from the feeding management software FeedWatch 7.0. The variables included were data, recipe, recipe number, ingredient, loading sequence, start loading time and end loading time. A total of 33 ingredient types were used across dairies. Data set included information from 50,909 recipe loads (487,218 ingredient loads). Descriptive statistics were conducted with SAS 9.3. Across dairies, the median recipe preparation time was [median (range)] 15 min 0 s (9 min 18 s to 27 min 0 s). The interquartile range (IQR = Q_3-Q_1) per dairy was <13 min 30 s (Q_1) and >16 min 58 s (Q_3). At least 20% (up to 68%) of the time, recipe preparation was < 10 min in 5 dairies, and at least 10% (up to 70%) of the time it was >25 min in 4 dairies. Across dairies, the median elapsed time from recipe preparation to start feeding was [median (range)] 3 min 48 s (1 min 54 s to 9 min 0 s). The IQR per dairy was <2 min 30 s (Q_1) and >5 min 10 s (Q_3). On 6 dairies, at least 70% (up to 80%) of the time, recipe preparation to start feeding took <3 min in 6 dairies. On 6 dairies, at least 20% (up to 30%) of the time it took >10 min. Across dairies, the median feeding time was [median (range)] 4 min 12 s (1 min 30 s to 10 min 48 s). The IQR per dairy was <3 min 20 s (Q_1) and >6 min 30 s (Q_3). At least 20% (up to 75%) of the time, feeding took <2 min in 4 dairies; and between 20 to 55% of the time, it was >10 min in 4 dairies. Overall, from recipe preparation to feeding, 25% of the times (Q_1) it took <15 min (n = 10), 15 to 20 min (n = 12) and >20 min (n = 4); and 25% of the time (Q_3) it took <25 min (n = 5), 25 to 35 min (n = 16) and >35 min (n = 5). There were important differences within and across dairies on time elapsed from recipe preparation to feeding. This may have implication on mixing and processing of the HCR recipe.

Key Words: dairy cattle, high cow ration, feeding management software

M290 Using first test milk yield and previous lactation data to assess herd transition cow management in Brazilian dairy farms. J. K. Poncheki[1], J. A. Horst[2], A. A. Valloto[2], and R. Almeida*[1], *[1]Universidade Federal do Paraná, Curitiba, PR, Brazil, [2]Associação Paranaense de Criadores de Bovinos da Raça Holandesa, Curitiba, PR, Brazil.*

The objective of this study was to develop an index to assess the management applied to dairy cows during transition period, known as Transition Cow Index (TCI), using information from official DHIA Paraná herds, Southern Brazil. Data set was assigned by Holstein Cattle Breeders Association from Paraná State (APCBRH) and it had originally 310,007 first monthly test-days collected between 5 and 40 d after calving from 2000 to 2013. To generate this index several information from

previous lactation were used. First-lactation data were excluded and animals were categorized in 2nd, 3rd, 4th, and 5th lactation or more. After editing, only Holstein data were kept in the final data set, which had 94,508 first test-days from 445 herds. Pearson correlations among independent variables and milk yield on first test-day were estimated by CORR procedure from SAS. Previous cumulative milk yield was the variable with the highest correlation with the first test-day milk yield (r = 0.42). Previous cumulative milk yield, DIM in prior lactation (linear and quadratic effects), linear somatic cell score at the last test-day of previous lactation, days dry (linear and quadratic effects), lactation number, month of calving, milking frequency and DIM at first test were the independent variables used in GLM procedure from SAS to generate an expected milk yield in the first test-day after calving. The expected daily production was compared with the actual production collected, to generate TCI in kg/d. During the whole period investigated, 50.9% of the analyzed data had positive TCI (above expectations) and 49.1% had negative TCI (below expectations) and the overall TCI average was −0.283 kg/d. The 5 best herds with 100 or more test-days had TCI average of 3.908 kg/d and the 5 worst herds with 100 or more test-days had TCI average of −5.589 kg/d. Transition Cow Index proved to be an efficient tool for evaluation of transition period management of Paraná herds. It is recommended to not overlook individual cows that fail and to use TCI only at herd level.

Key Words: early lactation, fresh cow performance, transition cow index

M291 Differences in rumination time, lying time, and rectal temperature between cows with and without metritis, ketosis, and subclinical hypocalcemia. I. C. Tsai*, L. M. Mayo, A. E. Stone, B. A. Wadsworth, and J. M. Bewley, *University of Kentucky, Lexington, KY.*

The objective of this study, conducted at the University of Kentucky Coldstream Dairy from June 2014 to January 2015, was to quantify differences in rumination time, lying time, and rectal temperature between cows with and without metritis, ketosis, and subclinical hypocalcemia. Precision dairy farming technologies used for these measurements included: SensOor (Agis Automatisering, Harmelen, the Netherlands) which measured ear movement, feeding time, rumination time, and ear skin temperature; Track-a-Cow (ENGS, Hampshire, UK) which measured lying time and time at the feed bunk; and Precision Xtra (Abbott Laboratories, Abbott Park, Illinois) which measured blood β-hydroxybutyrate (BHBA). Ten days before due date, technologies were assigned to cows. Blood serum samples were collected on 3, 7, 14, and 21 DIM and sent to the University of Kentucky Veterinary Diagnostic Laboratory for calcium analysis. The GLM procedure of SAS (Version 9.3, Cary, NC) was used to evaluate factors affecting metritis, ketosis, and subclinical hypocalcemia. Mean rumination time, lying time, and rumen temperature were calculated for the first 21 DIM. Average lying time percent for cows with subclinical hypocalcemia (63% ± 8%) was greater than for cows without subclinical hypocalcemia (57% ± 9%; $P < 0.002$). Average rectal temperature of metritis cows (39.13 ± 0.22) was higher than for cows without metritis (37.75 ± 0.29; $P \leq 0.05$). No differences in rumination time were observed between cows with or without metritis, ketosis, and subclinical hypocalcemia. Precision dairy farming technologies could be useful for detecting metritis, ketosis, and subclinical hypocalcemia.

Key Words: transition period, metabolic disease, precision dairy farming technology

M292 Bacterial and dry matter content of bedding substrates utilized on Canadian dairy farms. Ivelisse Robles*[1], David F. Kelton[2], Herman W. Barkema[3], Greg P. Keefe[4], Jean-Philippe Roy[5], Marina A. G. von Keyserlingk[6], and Trevor J. DeVries[1], *[1]Department of Animal and Poultry Science, University of Guelph, Guelph, ON, Canada, [2]Department of Population Medicine, University of Guelph, Guelph, ON, Canada, [3]Faculty of Veterinary Medicine, University of Calgary, Calgary, AB, Canada, [4]Atlantic Veterinary College, University of Prince Edward Island, Charlottetown, PEI, Canada, [5]Faculté de Médecine Vétérinaire, Université de Montréal, Montréal, QC, Canada, [6]Animal Welfare Program, University of British Columbia, Vancouver, BC, Canada.*

The objective of this study was to determine the bacteria and DM content of bedding substrates utilized on dairy farms. Seventy-two dairy farms in Ontario, Canada, were visited 3 times, 7 d apart. At each visit, composite samples of the unused and used bedding material were collected for DM determination and bacterial culturing of major pathogen groups (gram-positive, gram-negative, and *Klebsiella* spp.). Bedding substrates were classified by farm as following: sand (n = 12), straw and other dry forage (n = 34), wood products (shavings, sawdust; n = 17), and other (recycled manure solids, compost, digestate, peat moss; n = 10). Tests of bacteria counts and DM content were made between bedding types, as well as between unused and used samples, in a general linear mixed model. DM content of unused bedding varied with type ($P < 0.01$): sand was driest (92 ± 1.4%), followed by straw (88 ± 0.9%) and wood (85 ± 1.2%), while other types were wettest (39 ± 1.6%). DM content of used bedding was reduced ($P < 0.01$) for wood (75 ± 1.7%) and straw (77 ± 1.2%), increased for other types (48 ± 2.3%; $P < 0.01$), and did not change for sand (95 ± 2.1%; $P = 0.17$). Gram-positive bacteria counts did not vary with bedding type ($P > 0.25$) in unused (2.4 ± 1.2 ln cfu/mL) and used (16.1 ± 0.9 ln cfu/mL) samples. Gram-negative bacteria counts in unused bedding varied with type ($P < 0.01$): straw was greatest (12.6 ± 0.6 ln cfu/mL), followed by other types (8.1 ± 1.3 ln cfu/mL), then wood (4.7 ± 0.8 ln cfu/mL), while sand was least (2.4 ± 1.0 ln cfu/mL). Gram-negative counts in used samples were greater ($P < 0.01$) for other types (16.8 ± 1.1 ln cfu/mL), sand (14.2 ± 0.8 ln cfu/mL), and wood (10.0 ± 0.7 ln cfu/mL), while straw did not change (13.4 ± 0.5 ln cfu/mL; $P = 0.17$). *Klebsiella* spp. counts in unused bedding varied with type ($P < 0.01$): straw was greatest (11.4 ± 0.6 ln cfu/mL), while wood (4.2 ± 0.9 ln cfu/mL), other types (3.7 ± 1.4 ln cfu/mL), and sand (2.5 ± 1.0 ln cfu/mL) were similarly ($P > 0.6$) lower. *Klebsiella* spp. counts for used bedding were greater ($P < 0.01$) for other types (12.3 ± 1.3 ln cfu/mL) and sand (11.2 ± 1.0 ln cfu/mL), while wood tended ($P = 0.1$) to be greater (5.4 ± 0.9 ln cfu/mL), and straw did not change (11.4 ± 0.6 ln cfu/mL; $P = 0.99$). Overall, bedding types varied in their DM, particularly between unused and used samples.

Key Words: bedding, dry matter, bacteria count

M293 Risk factors affecting expression of estrus measured by activity monitors in lactating dairy cows. Augusto M. L. Madureira*[1,2], Bruna F. Silper[2], Liam B. Polsky[2], Eraldo L. Drago Filho[1], Sergio Soriano[3], Alex F. Sica[3], José L. M. Vasconcelos[1], and Ronaldo L. A. Cerri[2], *[1]Sao Paulo State University, Botucatu, SP, Brazil, [2]University of British Columbia, Vancouver, BC, Canada, [3]Colorado Dairies, Araras, SP, Brazil.*

The objective of this study was to determine risk factors related to increase in physical activity during estrus. Estrus events (n = 2,510) from 1,358 lactating Holstein cows from 2 commercial dairies were recorded. Cows were monitored continuously by 3 automated activity monitors (AAM). A collar-mounted accelerometer (Collar; Heatime,

SCR Engineers) and a leg-mounted pedometer (Leg1; Boumatic Heatseeker-TX) were used in farm 1. A second leg-mounted pedometer (Leg2; AfiMilk Pedometer Plus) was used in farm 2. For cows with collar and Leg1, only spontaneous estrus (SE) events were registered (1,099 events; 318 cows). Cows with Leg2-tags were induced to ovulate (IO; 1,411 events; 1,040 cows) through an E2/P4-based TAI protocol. Body condition score (BCS; 1 to 5 scale) was measured at moment of AI. SE cows' also had secondary signs of estrus (clear vaginal mucus, uterine tonus, signs of mounting) recorded. Milk production was recorded at each milking. Ovarian ultrasonography was performed at estrus. Data were analyzed by Pearson correlation and ANOVA. Collar, Leg1 and Leg2 systems' peak of activity (PA) and Collar's duration (DU) were affected by parity as multiparous expressed lower PA (69.3 ± 0.8 vs. 75.9 ± 1.1 index [Collar]; 323.9 ± 6.0 vs. 354.8 ± 8.5% [Leg1]; 323.04 ± 4.6 vs. 336.3 ± 5.3% [Leg2]) and shorter duration (10.7 ± 0.2 h vs. 12.0 ± 0.3 h) than primiparous. Cows with BCS ≤2.5 showed less intense estrus measurements (PA and DU). Lactation stage did not influence PA or DU of estrus. Cows that displayed secondary signs of estrus had greater PA and DU measured by Collar and Leg1 systems. Intensity progressively increased as more secondary signs were displayed. Milk production was negatively correlated with PA (r = −0.20), but no difference was observed in PA and DU when milk production was categorized into quartiles. Quantitative data from activity monitors can be used to survey estrus behavior in dairy cows, but must be calibrated based on risk factors to ensure accurate behavior interpretation.

Key Words: pedometer, estrus, body condition score

M294 Description of close-up cow recipes in California dairies. Sonia Rodriguez*[1], Yolanda Trillo[1], Alfonso Lago[2], and Noelia Silva-del-Rio[1], *[1]UC Davis School of Veterinary Medicine, VMTRC, Tulare, CA, [2]DairyExperts, Tulare, CA.*

The objective of this study was to describe close-up cow (CU) recipes prepared on 25 California dairies ranging in size from 1,100 to 6,900 cows. Records from a consecutive 12-mo period were extracted from the feeding management software FeedWatch 7.0. The variables included were date, recipe, recipe number, ingredient, loading sequence, target weight, actual weight and tolerance level. Descriptive statistics were conducted with SAS 9.3. Dairies prepared a median of one (n = 24) or 2 (n = 1) CU recipes per day. The median number of ingredients included in the CU recipe ranged from 3 to 5 (n = 18) and 6 to 9 (n = 7); and varied over time within dairy, by one (n = 7), 2 to 3 (n = 2), or zero (n = 16) ingredients. The most commonly used ingredients in CU recipes were rolled corn (n = 19), premix (n = 17; 5 prepared it on farm), liquids (n = 8), mineral-vitamins (n = 7), anionic salts (n = 6) and canola (n = 5). The most common forages included were corn silage (n = 24) and alfalfa hay (n = 20), and some dairies also used straw hay (n = 5) and oat hay (n = 7). The ingredients most frequently added first were alfalfa hay (n = 11), straw hay (n = 5) oat hay (n = 5), premix (n = 2), yeast (n = 1) and wheat (n = 1). The ingredients most frequently added last were corn silage (n = 11), liquids (n = 7), premix (n = 2), mineral-vitamins (n = 2), canola (n = 1), earlage (n = 1) or rolled corn (n = 1). The tolerance level (TL) (kg) of the various ingredients for all dairies enrolled was: 0 (11.2%), 0.5–20 (31.7%), 25–40 (33.5%), 50–75 (18.0%) and 100–150 (5.6%) kg. The TL allowed a deviation from the median formulated target for the various ingredients across dairies of: 0% (11.2%), > 0–2% (14.9%), > 2–5% (25.5%), > 5–10% (18.0%) and > 10% (30.4%). Deviation from target > 10% was allowed on 20 ingredient types on 20 dairies [alfalfa hay (n = 11), rolled corn (n = 8), mineral-vitamins (n = 4), corn silage (n = 3), canola (n = 3) and others (n = 2)]. Corn silage, alfalfa hay, rolled corn and premix were ingredients commonly found on CU recipes. In many dairies, the TL allowed to CU ingredients should be re-evaluated.

Key Words: dairy cattle, close-up cow ration, feeding management software

M295 Agritourism: Demographics and views of customers—In-depth look at Fair Oaks Farms. Ann Cummins*, Nicole Widmar, Candace Croney, and Joan Fulton, *Purdue University, W. Lafayette, IN.*

This research will use data from 3 mutually exclusive data sets, where all are representative of households in a given sample for age, sex, income, and region of residence. The 3 samples only differ in geographical location (National Survey n = 1004, 5-State Survey n = 1029, Indiana Survey n = 797). Through this presentation, we will highlight the rates of attendance at a variety of agritourism locations (i.e., national parks, museums, amusement parks, livestock farms, pick-your-own farms) and look at the demographics of those who attend these attractions, including an in-depth look at Fair Oaks Farms (FOF). In this survey we have questions which gather respondents self-reported perceptions of how well educated they are about agriculture and livestock production and questions which test their general knowledge level. We will look at consumers who attend livestock agritourism locations to see if they care more about animal welfare but are misinformed about production practices or if they care more about animal welfare and are more informed. The methods used for this research are the survey data collected and analysis via z-scores and cross tabulations. A brief highlight on the national sample includes that 15% of the sample had heard of FOF and 7% had attended FOF, we see that those who had been to FOF tended to be male, from the younger age categories, they tended to have pets, and were more highly concerned about animal welfare. They are less supportive than those who had not been to FOF for the growth of livestock agriculture in their county, but tended to more strongly believe in the importance of agriculture in the state which they reside as well as tended to be high dollar food purchasers in the supermarket.

Key Words: agritourism, consumer demographics, perceptions

M296 Management practices on Virginia dairy farms utilizing automated calf feeders. Alyssa M. Dietrich* and Robert E. James, *Virginia Polytechnic Institute and State University, Blacksburg, VA.*

The objective of this study was to evaluate management practices and calf performance on 6 Virginia dairy farms using automated calf feeders (Förster Technik, Engen, Germany) in their preweaning programs. Following an initial management survey, farms were visited biweekly for approximately 28 wk. At each visit, facilities were scored on cleanliness of feeders and quality of bedding, calf starter, and drinking water. Weights (estimated by heart girth) and hip heights were measured on calves within approximately 5 d of entering the feeder system or 5 d of being weaned and averaged by farm for each age group to estimate average daily gain (ADG) and average daily height gain (ADH) over the preweaning period. One farm was an exception to this procedure, where farm staff regularly measured hip heights and calf weights with a digital scale and ADG and ADH were calculated for individual calves. Blood was collected from calves 1–7 d of age by jugular venipuncture, transported on ice, and centrifuged to estimate total serum proteins by refractometry. Calf treatment and mortality records were collected at each farm visit. Median lactating herd size was 260, ranging from 110 to 850 cows. Each farm sorted calves by age into 2 pens per feeder, with a mean number of calves ± SD per pen of 10 ± 3. Mean ADG and

ADH ± SD of calves were 0.73 ± 0.11 kg and 0.21 ± 0.05 cm. Mean ± SD serum total protein levels were 5.80 ± 1.04 g/dl. According to treatment and mortality records, mean ± SD morbidity and mortality rates were 61.05 ± 18.48 and 3.14 ± 2.67%. All farms fed milk replacer and utilized a feeding plan with a mean starting allotment of 5.4 L/d, ranging from 4.0 to 6.0 L/d, and a mean peak allotment of 9.0 L/d, ranging from 7.0 to 16.0 L/d. Mean milk replacer concentration was 150 g powder/L water, with a range of 140 to 160 g powder/L water. Mean length of enrollment on the feeder system was 54.3 d, ranging from 48 to 63 d. The information from this study may provide insight to producers using or considering using automated feeders in their calf programs.

Key Words: dairy calves, management, automated calf feeder

M297 Calculation method alters the ratio of milk true protein production to milk urea nitrogen production in late-lactation cows fed four levels of dietary crude protein. Margaret A. Quaassdorff* and Michel A. Wattiaux, *University of Wisconsin-Madison, Madison, WI.*

Our preliminary data suggested that, using DHIA data only, the ratio of milk protein production (MPP, g/d) to milk urea nitrogen production (MUNP, g/d) might be a reliable and inexpensive indicator of nitrogen (N) use efficiency of dairy cows on commercial dairy farms. Although milk urea N (MUN, mg/dL) is an indicator of N intake and urinary urea-N excretion, it does not reflect milk protein synthesis. Our main objective was to compare 5 methods of calculation of MPP:MUNP ratio with the hypotheses that the ratio would be altered neither by calculation methods that use fewer DHIA variables nor by dietary CP level. Data were from samplings collected from 2 consecutive milkings (pm and am) in wk 12 of a study with 122 Holstein cows (mean ± SD: 303 ± 55 DIM; 761 ± 77 kg BW) fed a 16.2, 14.4, 13.1 or 11.8% CP (DM basis) TMR for 12 weeks. Methods of calculation were as follows: A) daily MPP divided by daily MUNP, where daily values were calculated using 6 DHIA values (milk production, milk protein %, and MUN for am and pm sampling, respectively); B) milk protein % divided by MUN (averages of am and pm for both); C) method B using am values only; D) method B using pm values only; and E) average of methods C and D. Ratios were analyzed in SAS 9.3 with PROC MIXED and single df orthogonal contrasts to compare methods B, C, D and E to method A. Overall, there was no difference between methods A and B, or A and E, but method C overestimated, and method D underestimated the MPP:MUNP ratio relative to method A (see Table 1.). These differences, however, were associated with high MPP:MUNP ratios observed when dietary CP were 13.1 and 11.8%. In this study, the MPP:MUNP ratios remained similar when calculated with average concentrations alone or average concentrations weighted for am and pm milk production.

Contd.

Table 1 (Abstr. M297). Comparison of 5 methods of calculation of MPP:MUNP ratio

Dietary CP	Method					Contrast *P*-value			
	A	B	C	D	E	A vs. B	A vs. C	A vs. D	A vs. E
16.2% of DM	291	289	309	274	291	0.906	0.222	0.239	0.982
14.4% of DM	333	329	364	304	334	0.838	0.119	0.150	0.946
13.1% of DM	494	480	627	397	512	0.760	0.009	0.043	0.686
11.8% of DM	763	744	1042	647	844	0.884	0.048	0.383	0.536
Overall	470	461	585	405	495	0.596	<0.001	<0.001	0.164

Key Words: nitrogen use efficiency, MUN, DHIA

M298 Seasonality distributions of number of breedings and conception rate of Florida dairy farms. Fernanda Ferreira*[1,2] and Albert De Vries[1], [1]*University of Florida, Gainesville, FL,* [2]*Embrapa Gado de Leite, Juiz de Fora, MG, Brazil.*

Florida dairy farms are seasonal in their reproductive performance due to the hot summers. The amount of seasonality across farms has not been quantified, however. The objective was to describe the distribution of seasonality in the number of breedings (NB) and the average conception rate (CR) of dairy farms in Florida. We used reproductive data from USDA-AGIL, collected through DHIA, from the year 2010. Farms with annual NB < 100 and annual average CR > 0.75 were not used. We calculated the ratio of breedings (BR) as the NB in a calendar month divided by the average monthly NB. We also calculated the CR per calendar month for each farm. A sigmoidal function was fitted per farm to measure seasonality as is common in economic studies. The final data set had 36 (BR) and 33 (CR) farms. Goodness of fit of the sigmoidal function was measured by the mean square of errors (MSE). Measures of seasonality were the range (max – min) and minmax ratio (min/max) from the sigmoidal functions. Means and 5th, 25th, 50th, 75th and 95th percentiles are reported as well as Pearson correlations. For the BR, the mean ± SD of MSE were 0.31 ± 0.73. In the fitted model, the mean ± SD of BR were 1.21 ± 1.08. The 5 percentiles were 0.94, 0.98, 0.99, 1.04 and 1.46, respectively. The mean BR range was 1.261 and the 5 percentiles were 0.10, 0.35, 0.695, 1.32 and 2.46, respectively. The mean minmax ratio of BR was 0.45 and 5 percentiles were −0.03, 0.27, 0.49, 0.70 and 0.90. For CR, the mean ± SD of MSE were 0.01 ± 0.01. The mean ± SD of CR were 0.40 ± 0.13. The 5 percentiles were 0.26, 0.30, 0.38, 0.43 and 0.63, respectively. The mean CR range was 0.30 and 5 percentiles were 0.09, 0.21, 0.27, 0.36 and 0.71 respectively. The mean minmax ratio of CR was 0.46 and the corresponding 5 percentiles were 0.05, 0.33, 0.46, 0.58 and 0.80, respectively. Correlations between the ranges and minmax ratios were −0.96 for BR and −0.72 for CR. Maximum values were typically observed around March and minimum values around August for both BR and CR. The sigmoidal function did not necessarily describe the seasonal pattern well. In conclusion, many farms were very seasonal but different measures of seasonality may be needed.

Key Words: seasonality, reproduction, dairy farm

M299 An evaluation of automated milking systems in the Midwest United States. Marcia I. Endres[1] and Jim A. Salfer*[2], *[1]University of Minnesota, St. Paul, MN, [2]University of Minnesota Extension, St. Cloud, MN.*

Automatic or robotic milking systems (AMS) are being adopted by dairy producers in the Upper Midwest United States at a relatively fast rate. There is limited research available on AMS in US dairies. This ongoing study is summarizing data collected from 52 AMS dairy farms in Minnesota and Wisconsin to describe characteristics of AMS systems and investigate factors that may influence AMS efficiency in US farms. Farms were visited once to collect housing and management information and then daily data from the AMS were remotely collected for approximately 18 mo. These data showed that on average cows were milked 2.61 ± 0.30(mean ± SD) times per day, produced 32.25 ± 6.81 kg of milk per day, and consumed 5.03 ± 0.95 kg of concentrate in the AMS per day. The number of cows per robot box was 70.25 ± 14.06 and it was greater for guided flow compared with free flow AMS farms (75.0 vs. 65.5 cows per robot). Forty farms had exclusively free flow cow traffic. Milking speed was 2.24 ± 0.40 L/min and total milk yield per robot unit was 1843.5 ± 490.9 L/day. Total daily milk yield per robot has been suggested to be an important characteristic to assess the efficiency of AMS. Proc CORR in SAS was used to conduct a preliminary analysis of factors associated with yield per robot and milk yield per day. Factors most strongly associated ($P < 0.001$) with yield per robot were milk per cow per day (r = 0.81) and average milking speed (r = 0.76). Other factors moderately associated ($P < 0.001$) with yield per robot were average concentrate consumed per cow per day (r = 0.31) and exit length from the AMS (r = 0.32). Protected AMS exit lane was 3.1 ± 2.4 m long and ranged from 0.3 to 8.5 m. Factors associated ($P < 0.001$) with average daily milk yield per cow were milking speed (r = 0.79), exit length (r = 0.51) and average concentrate consumed per cow per day (r = 0.41). Further multilevel regression analysis will provide a clearer picture of factors influencing efficiency of AMS in the United States.

Key Words: automated milking, robotic milking

M300 Factors affecting vaginal temperature in high-producing lactating Holstein cows. Eraldo L. Drago Filho*[1], Augusto M. L. Madureira[1], Liam B. Polsky[2], Sergio Soriano[3], Alex F. Sica[3], Jose L. M. Vasconcelos[1], and Ronaldo L. A. Cerri[2], *[1]Sao Paulo State University, Botucatu, SP, Brazil, [2]University of British Columbia, Vancouver, BC, Canada, [3]Colorado Dairies, Araras, SP, Brazil.*

The aim of this experiment was to evaluate the continuous collection of vaginal temperature for 72 h (every 10 min) in lactating Holstein cows (n = 480; 591 data collections) allocated in one single cross-ventilation barn. Cows were fitted with a thermometer attached to a progesterone intravaginal device before AI. Milk production, DIM, skin thickness, coat color, body condition score (BCS), and pregnancy per AI (P/AI) data were collected and recorded for further analyses. Ambient temperature and humidity was measured for 72 h using a data logger for calculation of the temperature and humidity index (THI). Data were analyzed using ANOVA and Pearson correlations using proc GLM, Corr and Logistic of SAS. Maximum THI (MAX) and percentage of time above a vaginal temperature of 39°C (PCT) were used as data logger responses, class variables were created for MAX and PCT (High vs Low) using the median threshold. There was a low correlation between THI and PCT (r = 0.01). Skin thickness was also poorly correlated with PCT (r <0.01). Cows with black color coat spent less time with high vaginal temperatures ($P = 0.05$). Primiparous ($P = 0.04$) and cows with low BCS ($P < 0.01$) had greater PCT. Milk production was affected by parity ($P < 0.01$) and PCT ($P = 0.02$; High = 43.5 vs Low = 41.2 kg/d). There was a milk production by MAX interaction for PCT ($P < 0.01$), whereas only cows in the highest milk production quartile (>50.7kg/d) spent more time with high vaginal temperatures. Among the independent variables included in the model, parity ($P < 0.01$), PCT ($P = 0.03$; 26.1 vs 17.4% for Low and High, respectively) and a PCT by milk production interaction ($P = 0.05$) affected P/AI. The decrease in P/AI in cows with High PCT only occurred in cows with the highest production. In summary, there is a large variability on how individual cows respond to heat stress. Parity, BCS, coat color and milk production affect PCT, particularly under high ambient temperatures. Selection of animals with efficient control of body temperature in spite of high milk production should be further approached as a strategy to maintain adequate fertility.

Key Words: heat stress, milk production, pregnancy per AI

M301 Prepartum activity is associated with increased plasma NEFA and body weight loss in postpartum dairy cows. Yu Zang*, Ida Holásková, and Joseph W. McFadden, *West Virginia University, Morgantown, WV.*

Monitoring physical activity of cattle is an estrus detection tool utilized on dairy farms. Lower than normal dairy cow activity can enhance postpartum metabolic disease risk (e.g., ketosis). Considering that NEFA mobilization and BHBA synthesis can promote metabolic disease, our objective was to investigate the relationship between activity and metabolic health markers in peripartal dairy cows. Seventy-one multiparous Holstein cows (713 ± 65 kg BW) housed in a commercial herd setting were continuously enrolled. Collar mounted activity meters (DeLaval) were worn by cows −45 d before expected calving until 10 DIM. Data were recorded at 1 h intervals. Blood was collected regularly. Plasma variables were measured and insulin sensitivity was estimated using RQUICKI. Cows were retrospectively categorized according to pre- and postpartum activity into those with the lowest (LOW; 25%), modest (MOD; 50%), and highest (HIGH; 25%) activity. Data were analyzed using a mixed model with repeated measures (fixed effects of activity and time). Nonparametric correlations were analyzed. For activity categorized from d −10 to −4, LOW had higher plasma NEFA on d −15 and 1, relative to HIGH (e.g., 744 vs. 367 μM on d 1; $P < 0.01$). LOW had decreased RQUICKI values and glucose levels on d −15 and 1, respectively, relative to HIGH ($P < 0.01$). For activity categorized from d 1 to 7, LOW had higher plasma NEFA on d 1, relative to HIGH ($P < 0.01$). Plasma BHBA and insulin were not modified by activity. Plasma NEFA levels were negatively correlated with previous 24-h activity on d 1 and 4 (r = −0.33 and −0.26, respectively; $P < 0.05$). RQUICKI values were positively correlated with previous 24-h activity on d 1 (r = 0.25; $P < 0.05$). Similar results were observed on d 1 and 4 when evaluating daytime activity. Prepartum activity was negatively correlated with postpartum BCS loss ($P < 0.01$). Lower prepartum activity of dairy cows is associated with reduced insulin sensitivity, and accelerated NEFA mobilization and BCS loss postpartum. Activity monitoring within large herds has the potential to serve as an inclusive alternative to laboratory NEFA testing.

Key Words: activity, dairy cow, metabolic health

M302 Adding antioxidants to ram sperm improves sperm binding capability after cryopreservation. Jonathan M. S. Costa[1], Wildelfrancys L. Souza[1], Elenice A. Moraes*[1], and James K. Graham[2], *[1]Federal University of San Francisco Valley, Petrolina, PE, Brazil, [2]Colorado State University, Fort Collins, CO.*

Cryopreserved mammalian sperm generally exhibit lower fertility than fresh sperm. An increasing number of antioxidants have been tested in attempts to improve semen quality, but improvements have not often been consistent or repeatable. The objective of this study was to determine if adding several different antioxidant combinations to ram sperm before cryopreservation could improve sperm binding to perivitelline membrane (PM) after thawing. Thirty ejaculates from 3 rams were split and diluted to 200 × 10^6 sperm/ml in an egg yolk tris diluent containing different antioxidants: control, with no antioxidant; 100 μ*M* Melatonin plus 0,05% ascorbic acid (MEL+AA); 100 μ*M* MEL plus 90μL Trolox C (MEL+TRO); 90μL TRO plus 0,05% AA (TRO+AA); and 100 μ*M* MEL plus 0,05% AA plus 90 μL TRO (MEL+AA+TRO). The samples were then cooled to 5°C, over 2h, and upon reaching 5°C were packaged into 0.5mL straws and frozen in static liquid nitrogen vapor for 15min before being plunged into liquid nitrogen. Straws were thawed for 30s in 37°C water and the motility and zona binding ability were determined using a CASA and fluorescence microscopy, respectively. Prior to binding analysis, sperm were stained with 35 μg/mL Hoechst 33342 for 15 min at 37°C, and then centrifuged at 400g for 5min and the sperm suspended in 1mL TALP and 5-μL aliquots (10,000 sperm prepared) were added to each PM. The membranes and sperm incubated together at 37°C for 2 h in an atmosphere of 5% of CO_2 in air, after which the PM were washed 5 times, placed onto a glass slide and examined using fluorescence microscopy at 400×. The number of sperm bound to the membrane in 6 predetermined fields of each membrane piece was counted. Data were analyzed by ANOVA using Tukey test. All antioxidants combinations maintained higher percentages of total and progressive motile cells after thawing, than control sperm ($P < 0.05$), with MEL+AA+TRO maintaining the highest percentage of motile sperm (49%). Sperm treated with MEL+AA+TRO exhibited the highest the number of sperm binding to the PM after thawing (177.63 cells; $P < 0.05$) compared with other treatments. Adding antioxidants to ram sperm before freezing increased the number of sperm surviving cryopreservation. Supported by FACEPE, CAPES and UNIVASF (Brazil).

Key Words: ascorbic acid, melatonin, vitamin C

M303 Distribution of detected estrus following 14-day CIDR and prostaglandin $F_{2\alpha}$ treatment as a pre-synchronization strategy in dairy heifers. Courtney K. Claypool*[1], Jennifer A. Spencer[1], Saulo Menegatti Zoca[3], Bahman Shafii[1], William J. Price[1], Amin Ahmadzadeh[1], Neil R. Rimbey[2], and Joseph C. Dalton[2], *[1]University of Idaho, Moscow, ID, [2]University of Idaho, Caldwell, ID, [3]UNESP, Botucatu, Sao Paulo, Brazil.*

Pre-synchronization is an effective management strategy in lactating dairy cows to increase the number of animals in estrus and facilitate AI during a desired time interval. However, it is not a strategy often used in nulliparous dairy heifers. The objective was to characterize the distribution of detected estrus following a 14-d CIDR and prostaglandin $F_{2\alpha}$ (PG) treatment as a pre-synchronization strategy in cyclic dairy heifers. Holstein heifers (n = 119) received a CIDR on d −30, and had the CIDR removed 14 d later on d −16. All heifers then received an Estrotect patch and were observed daily to facilitate detection of estrus. Following removal of the CIDR, 115/119 (96.7%) heifers were detected in estrus within 5 d. The proportion of heifers detected in estrus ± SE for each d after CIDR removal was: d 1: 12.6% ± 3% (15/119); d 2: 55.5% ± 5% (66/119); d 3: 18.5% ± 4% (22/119); d 4: 8.4% ± 3% (10/119); d 5: 1.7% ± 1% (2/119). Four heifers were not detected in estrus. Sixteen d after CIDR removal, all heifers received an injection of PG (25 mg i.m.) upon entry to the AI pen (study d 0). All heifers received tail paint and were observed for behavioral estrus daily. Following PG treatment, 114/119 (95.8%) heifers were detected in estrus within 5 d. The proportion of heifers detected in estrus ± SE for each d after PG treatment was: d 1: 3.3% ± 2% (4/119); d 2: 16.0% ± 3% (19/119); d 3: 59.7% ± 5% (71/119); d 4: 16.8% ± 3% (20/119); d 5: 0% (0). Five heifers were not detected in estrus. For the 2 estrus events observed, peak activity was detected 2 d after CIDR removal and 3 d after PG treatment. Pre-synchronization with a 14 d CIDR and PG protocol appears to be an effective strategy to facilitate detection of a high percentage of dairy heifers in estrus.

Key Words: dairy heifer, pre-synchronization, CIDR

M304 Feeding time variation on California dairies. Yolanda Trillo*[1], Sonia Rodriguez[1], Alfonso Lago[2], and Noelia Silva-del-Rio[1], *[1]UC Davis School of Veterinary Medicine, VMTRC, Tulare, CA, [2]DairyExperts, Tulare, CA.*

The objective of this study was to describe the variation of high cow ration (HCR) recipe feeding on 26 California dairies ranging in size from 1,100 to 6,900 cows. Records from a consecutive 12-mo period were extracted from the feeding management software FeedWatch 7.0. The variables included were date, recipe, recipe number, feeding sequence, start feeding time, end feeding time, target weight, actual weight and pen number. Data set included information from 51,195 recipes. Descriptive statistics were conducted with SAS 9.3. The median day-to-day variation on start feeding time [median (range)] was |12| min (|6| to |60| min). The interquartile range (IQR = Q_3 - Q_1) per dairy was | <15| min (Q_1) to | >33| min (Q_3). On 23 dairies, at least 70% (up to 93%) of the feedings were done within 15 min from the previous day feeding time. Across dairies, at least 2% of the time feedings were delayed by 60 to 90 min (n = 23; up to 17% of the time), by 90 to 120 min (n = 23; up to 5%), and by >120 min (n = 26; up to 9.6%). On 9 dairies, at least 5% (up to 25%) of the total feedings were delayed at least by 2 h relative to the previous day. On those dairies, delays affected 75 to 100% of the pens, at least once. Feeding delays of 2 h or more were observed in all dairies, ranging from 0.05 to 2% (n = 18), 2 to 5% (n = 7) and 9.6% (n = 1). The median time elapsed between the last feeding to the first feeding of the next day was 23 h 50 min, 14 h 20 min to 23 h 30 min and 15 h 50 min to 19 h 00 min for dairies feeding once a day (n = 2), twice a day (n = 18), and thrice a day (n = 6). The IQR for the time elapsed between the last feeding to the first feeding was <1 h 20 min (Q_1) to >4 h 25 min (Q_3). The median time to complete the first feeding to all HCR pens [median (range)] was1 h 18 min (10 min 58 s to 4 h 24 min). The IQR was <18 min (Q_1) to >45 min (Q_3). At first feeding, the amount of HCR recipe delivered [median (range)] was 49.7% (33.1 to 100%) of the total amount fed per day. The IQR was <1.8% (Q_1) and >19.4% (Q_3). Based on our data, some dairies could improve their time consistency at first feeding.

Key Words: dairy cattle, high cow ration, feeding time consistency

M305 Association among body condition score change, milk yield, and reproductive performance of Holstein cows. Ricardo C. Chebel*[1], Pablo J. Pinedo[2], Jose E. P. Santos[1], Gustavo Schuenemann[3], Guilherme J. M. Rosa[4], Robert Gilbert[5], Rodrigo C. Bicalho[5], Klibs N. Galvao[1], Christopher Seabury[6], John Fetrow[7], William W. Thatcher[1], and Sandra L. Rodriguez-Zas[8], *[1]University of Florida, Gainesville, FL, [2]Texas A&M AgriLife Research, Amarillo, TX, [3]Ohio State University, Columbus, OH, [4]University of Wisconsin, Madison, WI, [5]Cornell University, Ithaca, NY, [6]Texas A&M University, College Station, TX, [7]University of Minnesota, St Paul, MN, [8]University of Illinois at Urbana-Champaign, Urbana, IL.*

Objectives were to determine the association among body condition score change from calving to 35 DIM, resumption of cyclicity by 50 DIM and both productive and reproductive performance. Holstein cows (n = 5,175) from 9 dairy herds from the Southwest, Southeast and Midwest of the USA were used in this experiment. Cows were BCS at 3 ± 3 and 35 ± 3 DIM. Cows were classified according to BCS change [Gained(G), No change(NC), Moderate loss(ML) = −0.25 to −0.75, and Extreme loss(EL) < −0.75]. Study personnel examined cows for retained placenta and metritis. Blood sampled at 7 DIM was used to diagnose ketosis (BHB >1.0 mmol/L). Calf gender, occurrence of calving problems (twins, stillbirth, and dystocia), and occurrence of mastitis, displacement of abomasum, and respiratory illness within the first 60 DIM were recorded. Cows were milk thrice daily and average milk yield in the first 90 DIM recorded. Continuous data were analyzed by ANOVA, dichotomous data were analyzed by logistic regression, and pregnancy hazard ratio was analyzed by Cox Proportional Hazard Ratio. The interaction between BCS at 3 DIM and BCS change was associated with milk yield ($P < 0.01$). Among cows calving with BCS < 3.25, milk yield was lowest for cows gaining BCS and cows with extreme BCS loss from 3 to 35 DIM (G = 34.4 ± 0.3,NC = 37.1 ± 0.3,ML = 38.2 ± 0.3,XL = 34.4 ± 4.4kg/d). Among cows calving with BCS = 3.25 to 3.5 (G = 35.4 ± 0.5, NC = 36.3 ± 0.3,ML = 37.9 ± 0.2, XL = 39.1 ± 1.0kg/d) and cows calving with BCS >3.5 (G = 26.0 ± 2.3,NC = 35.0 ± 1.0,ML = 37.5 ± 0.4, XL = 38.5 ± 0.9kg/d) milk yield was greatest when cows had extreme BCS loss from 3 to 35 DIM. Change in BCS from 3 to 35 DIM was associated ($P < 0.01$) with likelihood of cows resuming cyclicity by 50 DIM (G = 78.8%, NC = 76.4%,ML = 74.8%, XL = 75.9%). Although BCS change was not associated ($P < 0.02$) with the probability of pregnancy after first postpartum AI, pregnancy hazard ratio was associated with BCS change from 3 to 35 DIM [G = 1.2 (0.99, 1.56), NC = 1.21 (0.98,1.51),ML = 1.10 (0.90,1.36), EL = referent]. In conclusion, excessive loss of BCS from 3 to 35 DIM was associated with greater milk yield and reduced cyclicity and reproductive performance.

Key Words: Holstein cow, body condition score, reproductive performance

M306 Animal and dietary factors associated with daily rumination time during the periparturient period. Daniela N. Liboreiro*[1], Luiz Ferraretto[2], Randy Shaver[2], and Ricardo C. Chebel[1,3], *[1]University of Minnesota, St Paul, MN, [2]University of Wisconsin, Madison, WI, [3]University of Florida, Gainesville, FL.*

The objectives of the current experiment were to determine the association among animal and feed factors associated with daily rumination of periparturient dairy cows. Holstein animals (n = 297) were fitted with collars that record minutes of rumination every 2 h and activity every 2 h (SCR) from −21 to 21 d relative to calving. Rumination data were analyzed in 24 h intervals. Animal data collected were parity, twining, calf sex, animal body condition score at −21 d relative to calving, and days relative to calving. Total mixed ration samples were collected twice weekly. Samples from the same week were combined and analyzed for crude protein, neutral detergent fiber, ether extract, ash, and non-fiber carbohydrate. Furthermore, weekly feed samples were evaluated for particle size using a 4-panel particle separator. Physically effective fiber was calculated. Each pen in which study cows were housed had a temperature humidity HOBO and temperature humidity index were calculated. Daily rumination data were analyzed, separately for the prepartum and postpartum periods, by ANOVA using the MIXED procedure of SAS. A stepwise backward elimination procedure was conducted and only independent variables with $P < 0.10$ were kept in the final model. During the prepartum period, non-fiber carbohydrate ($P < 0.01$) was positively associated with daily rumination time and parity ($P = 0.04$), days relative to calving ($P = 0.01$), BCS at −21 d relative to calving ($P = 0.05$), twining ($P = 0.08$), daily average THI ($P < 0.01$), crude protein ($P < 0.01$), neutral detergent fiber ($P < 0.01$), ash ($P < 0.01$), and physically effective NDF ($P = 0.01$) were negatively associated with daily rumination time. During the postpartum period, days relative to calving ($P < 0.01$), crude protein ($P < 0.01$), ether extract ($P = 0.01$), non-fiber carbohydrate ($P < 0.01$) were positively associated with daily rumination time and parity ($P < 0.01$), daily average THI ($P < 0.01$), neutral detergent fiber ($P < 0.01$), ash ($P < 0.01$), were negatively associated with daily rumination time. The findings of the current experiment demonstrate that variability in daily rumination time is dependent on several animal, dietary, and environmental factors.

Key Words: Holstein cow, rumination

M307 Deviation from the formulated target weight for ingredients loaded into the high cow ration on California dairies. Yolanda Trillo*[1], Alfonso Lago[2], and Noelia Silva-del-Rio[1], *[1]UC Davis School of Veterinary Medicine, VMTRC, Tulare, CA, [2]DairyExperts, Tulare, CA.*

The objective of this study was to describe the deviation from target weight of the various ingredients added into the high cow ration (HCR) on 26 California dairies ranging in size from 1,100 to 6,900 cows. Records from a consecutive 12-mo period were extracted from the feeding management software FeedWatch 7.0. The variables included were date, recipe, recipe number, ingredient, loading sequence, target weight, actual weight and tolerance level (TL, deviation allowed per ingredient during loading). Descriptive statistics were conducted with SAS 9.3. The median TL assigned to ingredients across dairies ranged from 9 to 90 kg. The TL allowed a deviation from the median formulated target for the various ingredients across dairies of 0% (8.7%), > 0–2% (45.2%), > 2–5% (25.5%), > 5–10% (11.6%) and > 10% (9.0%). A total of 2.5% of the observations did not reach the target weight set by TL, and represented from 0.1 to 21.1% of all loads within a given dairy. Across dairies the median deviation from the target weight for the HCR recipe varied from < −2 (n = 2), −2 to < −1 (n = 2), −1 to 0 (n = 6), > 0 to 1 (n = 11), > 1 to 2% (n = 3), > 2% (n = 2). Seven dairies had 20 to 47% of their loads with a deviation from target > 40 kg. On 2 dairies 59% and 27% of the observations had a deviation from target of < −40 kg. Rolled corn and almond hulls were loaded with an interquartile range (IQR = Q_3-Q_1) | < 20| kg on 68% of the dairies. The deviation from target (Q_1) was | < 10| kg on 77% of the dairies. Overall, alfalfa hay, corn silage and canola had a IQR > 20 kg on 60 to 62% of the dairies, and a deviation from target (Q_3) | > 40| kg on 35 to 45% of the dairies. This represents a deviation (as percentage) of 2.1 to 12.9% (alfalfa hay), 2.2 to 5.5% (corn silage), and 2.3 to 7.3% (canola). Some dairies were able to load ingredients very close to the target weight, however, dairy producers should evaluate if readjusting the TL settings of some ingredients might reduce the deviation from target weight.

Key Words: dairy cattle, loading deviations from target, feeding management software

M308 Feeding frequency of the high cow ration recipe on California dairies. Yolanda Trillo*[1], Alfonso Lago[2], and Noelia Silva-del-Rio[1], *[1]UC Davis School of Veterinary Medicine, VMTRC, Tulare, CA, [2]DairyExperts, Tulare, CA.*

The objective of this study was to describe the feeding frequency of high cow ration (HCR) recipe on 26 California dairies ranging in size

from 1,100 to 6,900 cows. Records from a consecutive 12-mo period were extracted from the feeding management software FeedWatch 7.0. The variables included were date, recipe, recipe number, feeding sequence, start time, end time and pen number. Descriptive statistics were conducted with SAS 9.3. The median frequency of feedings per pen within a dairy varied from 1 (n = 2), 2 (n = 10), 1 to 2 (n = 6), 1 to 3 (n = 4) and 2 to 4 (n = 1) times per day. Sixteen dairies had at least 90% of the pens fed the same number of times consistently (80% of the times or more) and 10 dairies had at least 30% of the pens fed the same number of times inconsistently (60% of the times or less). For dairies with a median of 2 feedings per day (n = 18), the time elapsed between the first and second feedings was <3 h (n = 8), from 3 to 6 h (n = 8), and from 6 to 9 h (n = 8). For dairies with 3 feedings per day (n = 6), the time elapsed between the first and the second feeding ranged from 2 to 4 h, and between the second and the third feeding was between 2 to 5 h. Dairies with 1, 2, or 3 feedings per day started feeding at 0300 or 0530 a.m. (n = 2), 0215 to 1030 a.m. (n = 18), and 0200 to 0815 a.m. (n = 6) respectively. The last feeding was done from 0530 a.m. to 1530 p.m. for dairies feeding 2 times (n = 18) and from 0800 a.m. to 1330 p.m. (n = 6) for dairies feeding 3 times. Some dairies were consistent (at least 85% of the time), feeding each recipe load to a single pen (n = 4), 2 pens (n = 2) or 3 pens (n = 2). However, most dairies (n = 18) split a recipe load among a combination of 1, 2, 3, 4, or more than 4 pens. At least 50% of the times, a recipe load was split among 4 or more pens in 3 dairies. One dairy split 37% of the times a recipe load among 8 pens. There was an important variation on the number of feedings per pen within and across dairies. Many dairies were inconsistent on how they split a recipe load among pens.

Key Words: dairy cattle, high cow ration, feeding management software

M309 The effects of milk production class on serum haptoglobin concentrations in mid-lactation Holstein cows with and without clinical mastitis. G. Taasoli*[1], F. Kafilzadeh[1], D. Ghadimi[2], and M. A. Ballou[3], *[1]Department of Animal Science, Razi University, Kermanshah, Iran, [2]Institute of Physiology and Biochemistry, MRI, Karlsruhe, Germany, [3]Department of Animal and Food Sciences, Texas Tech University, Lubbock, TX.*

This experiment investigated the link between production class and inflammation in mid-lactation Holstein cows with or without clinical mastitis. Forty cows were sampled, 20 positive for clinical mastitis and 20 healthy control cows. Within the mastitis and healthy groups, cows were further classified by level of milk production (Low = 23 to 25 kg/d vs. High = 28 to 35 kg/d). Therefore the experimental design was a 2 × 2 factorial with health status and level of milk production as the main effects (n = 10 cows per health status x level of milk production). All cows were sampled from a single commercial dairy farm with 1200 lactating Holstein cows with an average milk yield of 28 kg/d. Sampled cows were 80 to 120 DIM in their 2nd or 3rd parity. A positive mastitis case was defined as clinical signs and a positive California mastitis test. Cows had ad libitum access to feed and water. A peripheral blood sample was collected from each cow and analyzed for plasma haptoglobin concentrations. Among the healthy cows, plasma haptoglobin concentrations were greater for the high production group compared with the low production group (132 ± 12.9 vs. 93 ± 23.0 μg/mL; $P \leq 0.05$). Although cows with mastitis had greater plasma haptoglobin concentrations compared with the healthy cows, there was no difference ($P = 0.71$) between the low and high milk production groups for cows with clinical mastitis (1,193 ± 238 vs. 1,145 ± 211 μg/mL, high and low, respectively). These data indicate that increased milk production among healthy Holstein cows may cause an increase in low level inflammation when compared with cows that produced less milk. The mild increase in plasma haptoglobin concentrations may be associated with a greater intake of certain nutrients and/or overall metabolic activity. Clinical mastitis caused a large increase in plasma haptoglobin concentrations that was independent of milk production class.

Key Words: inflammation, mastitis, production