Production, Management, and Environment II

T175 Effects of different heating time of high, medium, and low quality colostrum on IgG absorption in dairy calves. D. J. Saldaña*, 1 S. L. Gelsinger, C. M. Jones, and A. J. Heinrichs, 1Department of Animal Science, The Pennsylvania State University, University Park, PA, 2Department of Dairy Science, The University of Wisconsin, Madison, WI.

The objective of this study was to determine the effect of different heating times with 3 levels of colostrum IgG content on passive transfer from a single feeding of colostrum. Colostrum was collected from The Pennsylvania State University dairy and divided by quality (high, medium, or low) based on colostrometer measurement. Colostrum within each quality was pooled to create 3 unique batches. Each batch was further divided in thirds as follows: frozen to be fed without heat treatment, heated at 60°C for 30 min, or heated at 60°C for 60 min. Colostrum samples from each treatment were collected and tested for standard plate count, gram-negative non-coliforms, coliforms, and total IgG concentration. Serum samples were collected from 108 Holstein calves before feeding colostrum and 24 h after birth. These were analyzed for total protein, total IgG, and hematocrit. Colostrum quality (high, medium, or low), heat treatment (unheated, 60°C for 30 min or, 60°C for 60 min), and their interaction were analyzed as fixed effects, with calf sex included as a random block effect. Colostrum IgG was different between quality groups (92.5, 59.4 and 48.1 mg/mL of IgG; P < 0.01). Heating colostrum reduced IgG concentration compared with the control by 9% when heated for 30 min and by 12% when heated for 60 min. Colostrum heated for 60 min had a lower standard plate count than colostrum heated for 30 min or not heated (3.6, 2.0 and 1.8 log cfu/mL). Serum IgG concentration at 24 h increased as colostrum quality increased (18, 22.2 and 24.8 mg/mL; P = 0.02) and tended to increase as heat treatment time increased (19.7, 20.3 and 25 mg/mL of IgG; P = 0.06). Apparent efficiency of absorption was greater in calves that received medium quality colostrum compared with calves fed high quality colostrum (38.1 and 25%; P < 0.01). These results suggest there may be an upper limit to the amount of IgG absorption in a given time period and that medium or high quality colostrum yields similar blood IgG absorption given the same volume of intake.

Key Words: calf, colostrum, immunoglobulin G

T176 Factors influencing the electrical resistance of various pathways through the dairy cow. R. J. Norell*, 1 J. A. Spencer, S. M. Zoca, and A. Ahmadzadeh, 1University of Idaho, Idaho Falls, ID, 2University of Idaho, Moscow, ID.

In a series of trials, we evaluated several factors that may influence electrical contact resistance of dairy cattle: manure depth, standing surface, hair coat condition, mouth area connections, and bedding in manure. Mouth to single hoof pathways were created by placing a metal bit in the mouth while the cow stood in separate plastic trays for each hoof. Treatments were applied equally between right and left hooves. In trial 1, 2 manure depths (0.3 and 2.5 cm) on metal grids were compared with 20 cows on 2 consecutive days. In Trial 2, 30 cows stood in 2.5 cm of manure with half their feet on a metal grid and half on concrete. In Trials 3 and 4, all 4 feet stood on metal grids with manure. Trial 3 treatments (n = 20) varied by contact location (neck and rump) and hair coat condition (dry, moist, and wet), whereas Trial 4, treatments varied by mouth area contact (bit in mouth, nose tongs, drinking water). Trial 5 was a laboratory study comparing the electrical resistance of manure:bedding blends with 0 to 25% (wt/wt) added bedding in 5% increments for compost, sand, and straw. In trial 1, resistance of the mouth to single hoof pathway was significantly less (P < 0.01) for deeper versus shallow manure. In Trial 2, the resistance was less for the metal grid standing surface than the concrete standing surface regardless of manure presence (P < 0.01). In Trial 3, resistance of the rumen to all hooves pathway was less than the neck to all hooves pathway (P < 0.01), and regardless of body location, decreased (P < 0.01) as hair coats were either missed or wetted to the skin compared with a dry hair coat. In Trial 4, resistance for the mouth to all hooves pathway was significantly greater (P < 0.01) when cows drank water from a metal bucket compared with a bit in the mouth or nose tongs. In Trial 5, adding compost or sand bedding to manure has a minimal effect on resistance whereas adding straw (over 10%) significantly increased electrical resistance (P < 0.01). We concluded that contact resistance of varying pathways through dairy cows are influenced by manure depth, standing surface, hair coat condition, mouth area connections, and straw bedding in manure.

Key Words: electrical resistance, stray voltage, dairy cattle

T177 Partitioning the resistance of electrical pathways through the cow into component segments. R. J. Norell*, 1 J. A. Spencer, S. M. Zoca, and A. Ahmadzadeh, 1University of Idaho, Idaho Falls, ID, 2University of Idaho, Moscow, ID.

The electrical resistance of dairy cattle includes internal body resistance and resistance of pathway contacts. Partitioning resistance into various segments is useful for assessing relative contributions of each component and for modeling the effects of varying contact resistance on total pathway resistance. Resistance of 6 pathways through 20 lactating cows housed in a free-stall barn were measured: mouth to all hooves (M4), mouth to front hooves, mouth to rear hooves, front to rear hooves (FTR), mouth to flank, and flank to rear hooves. Electrical contacts were applied with a horse bit in the mouth, hooves on separate metal grids with a manure covering, and a 5 x 5 cm aluminum probe applied to the flank with a wet hair coat. Body resistance (ohms) was modeled and partitioned into 4 components: head and neck (HN), front legs (FL), abdomen (A), and rear legs (RL). The median resistance for NH, FL, A, and RL were 106 ± 3, 195 ± 5, 11 ± 1, and 184 ± 4 ohms (Ω), respectively. Contact resistance of the hooves can potentially change due to wet versus dry concrete, wet versus dry manure, wet hooves, presence of bedding, and loss of hoof integrity. Based on the model, assuming individual hoof contact resistance increases by 40 Ω, then the modeled M4 and FTR pathway resistance increase by 10 and 40 Ω, respectively. Assuming lameness causes a loss in hoof integrity and lowers individual hoof resistance by 50%, then the modeled M4 and FTR resistance are estimated to decrease by 19 and 65 Ω with a lame front hoof. Additional research is needed to (a) confirm whether the model component estimates are consistent between a research facility and commercial dairy operations; and (b) refine estimates of environmental factors on contact resistance.

Key Words: electrical resistance, stray voltage

T178 Effect of virginiamycin on milk yield and composition under commercial conditions in Mexico. M. A. Gorocica*, 1 G. Velasco, and A. Relling, 1Phibro Animal Health Corp., Teaneck, NJ, 2The Ohio State University, Wooster, OH.

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The objective of the present study was to evaluate the effect of virginiamycin (VM) inclusion on milk yield and composition in Holstein cows maintained under commercial conditions in Mexico. Four pens of lactating cows (approx. 100 cows each) were blocked based on lactation number (LN), DIM, and milk yield (2.1 and 2.3 LN; 190 and 115 DIM; and, 47.3 and 48.5 L/d, for blocks 1 and 2 respectively) and assigned to 2 treatments. Control cows (CT) were fed a diet balanced to meet or exceed their nutrient requirements (NRC, 2001); Treated cows (TR) were fed the CT diet plus 500 mg/cow/d of VM. Diets were randomly assigned within each block. Diets were based on corn silage and steam-flaked corn. Feed offered and refused was weighted and analyzed daily to determine pen DMI. The study lasted for 42 d; d 1–19 for adaptation, and d 20–42 to measure milk yield and composition. Individual milk records were obtained daily. Additionally, one pooled milk sample per pen was collected for milk fat and protein determination using a MilkoScan Mars equipment (FOSS, Hillerød, Denmark). A mixed model analysis with repeated measures was conducted at the end of the trial. The model included treatment as fixed effect and block as random effect. No cows were diagnosed with clinical acidosis during the course of trial and no day × treatment interactions were observed (all P > 0.10). However, milk yield, milk fat, and ECM were significantly greater in the TR group (P < 0.01; Table 1). TR cows tended to have greater DMI but milk:feed ratio was not affected by treatment (P > 0.10). Milk fat:protein ratio was significantly increased (P < 0.01) suggesting the effects on milk yield and composition may have been related to VM preventing the development of SARA and other related digestive disorders.

### Table 1 (Abstr. T178). Milk yield, composition, ECM yield, and DMI during the measurement period

<table>
<thead>
<tr>
<th>Item</th>
<th>CT</th>
<th>TR</th>
<th>SEM</th>
<th>Treatment effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk yield, L/d</td>
<td>42.7</td>
<td>43.3</td>
<td>0.25</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Milk fat, %</td>
<td>3.43</td>
<td>3.49</td>
<td>0.120</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Milk protein, %</td>
<td>3.30</td>
<td>3.28</td>
<td>0.004</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>ECM1, kg/d</td>
<td>42.8</td>
<td>43.7</td>
<td>0.16</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Fat:Protein</td>
<td>1.04</td>
<td>1.06</td>
<td>0.003</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>DMI, kg/d</td>
<td>27.4</td>
<td>27.8</td>
<td>0.20</td>
<td>0.08</td>
</tr>
<tr>
<td>Milk:DMI</td>
<td>1.57</td>
<td>1.56</td>
<td>0.011</td>
<td>0.67</td>
</tr>
</tbody>
</table>

1ECM = 0.327 × Milk yield, lb + 12.95 × Fat yield, lb + 7.65 × Protein yield, lb.

Key Words: virginiamycin, dairy, production

T179  Milk production, intake and ingestive behavior of Holstein cow fed total mixed ration or partial mixed ration in early lactation. M. Ceriani*, A. Jasinsky, M. Carriquiry, and D. A. Mattiauda, Facultad de Agronomía, Universidad de la República, Montevideo, Uruguay.

The study objective was to evaluate the effect of 2 feeding strategy on animal performance, DM intake and ingestive behavior of lactating cows. Eighteen primiparous cows (528 ± 40 kg BW; 3.2 ± 0.2 BCS; autumn calving) were assigned to one of 2 nutritional treatments from calving to 65 DIM: (G0) TMR ad libitum (55:45, forage:concentrate) or (G1) grazing of Lucerne (6-h grazing in 3-d strips; 20 kgDM/d) + 70% of ad libitum PMR intake. All cows consumed 2.0 kgDM/d of a commercial ration at each milking. Milk yield was determined daily, milk composition weekly, and BW and BCS every 14 d. Diurnal cow behavior was recorded every 15 min, during 3 consecutive day, at wk 3 and 6 of lactation. During the grazing session, the number of bites were counted during 1 min. Individual herbage intake was estimated using cow energy requirements. Data were analyzed with a mixed model including treatment, DIM, and their interaction as fixed effects, block and cow as random effects and calving data as a covariate. Solid corrected milk yield tended (P = 0.07) to be greater for G0 than G1 cows (27.9 vs. 25.6 ± 0.58 kg/d). Cow BW did not differ but BCS was greater (P = 0.01) for G0 than G1 cows (2.9 vs. 2.6 ± 0.06). Neither total DM nor energy intake differed between treatments (16.7 vs. 17.3 ± 0.46 kgDM/d for G0 and G1, respectively). For G1 cows, the proportion of time dedicated to grazing was greater (P < 0.05) for wk 3 than 6 (54 vs. 33%, respectively) but bite rate was less (P < 0.05) in wk 3 than wk 6 (36 vs. 44 ± 1.3 bite/min, respectively). In wk 3, the proportion of time spent for feed (pasture and TMR) consumption was greater (P < 0.01) for G1 than G0 cows (51 vs. 27%), while in wk 6 it did not differ (P = 0.91) between treatments. In wk 3, G0 cows spent more time ruminating and idling at morning (16 and 9%; respectively) than G1 cows. Despite similar DM intake, G1 presented decreased solid corrected milk yield and BCS than G0 cows which would suggest greater energy expenditure in the former ones, probably explained by the increased time dedicated to food collection.

Key Words: nutrition, animal behavior

Our objective was to investigate the association between feed bunk refusals (FBR) with feed conversion efficiency (FCE) in 2 commercial dairy farms with compost bedded pack barns in Argentina (Chiavassa Dairy, CD; LaCenobia Dairy, LD). For 5 mo (September 2017 to January 2018), we daily registered DM offered (DMO, kg/d), DMI (kg/d), milk yield (MY, kg/d), FCE (kg milk/kg DMI), and FBR (%DMO) in 4 pens (0 to 150 DIM; 230 and 150 cows/pen at CD and LD, respectively). Milk yield was averaged by pen and DMI was estimated by difference between feed offered and refused. TMR DM content was determined with a forced-air oven for 2 h at 135°C. At CD, cows were milked 3x/d and fed 2x/d with a TMR composed by corn silage, alfalfa silage, alfalfa hay, corn grain, soybean meal, and mineral premix that averaged 49.8% DM, 15.8% CP, 29.9% NDF, and 2.89 Mcal ME/kg DM. Milk yield, DMI, and FBR (mean ± SE) was 42.06 ± 6.01 kg/d, 23.88 ± 2.42 kg/d, and 6.90 ± 4.38%DMO, respectively. At LD, cows were milked 2x/d and fed 1x/d with a TMR composed by corn silage, alfalfa silage, wheat silage, corn grain, soybean meal, peanut meal, and mineral premix that averaged 46.0% DM, 16.3% CP, 31.9% NDF, and 2.41 Mcal ME/kg DM. Milk yield, DMI, and FBR (mean ± SE) was 26.22 ± 2.15 kg/d, 22.55 ± 2.31 kg/d, and 6.45 ± 5.93%DMO, respectively. We run Pearson correlations to evaluate association between FCE and MY, DMI, and FBR (InfoStat, 2017). Effect of FBR level (0–3%, 3–6%, and >6%) was also evaluated with a mixed linear model with FBR level and day as fixed and pen within dairy as random effects. For both dairies, FCE was positively (P < 0.05) correlated with MY (r = 0.50 CD; r = 0.24 LD) and FBR (r = 0.38 CD; r = 0.74 LD) and negatively (P < 0.05) correlated with DMI (r = 0.33 CD; r = 0.68 LD). FBR level affected (P < 0.05) DMI and FCE, but it did not MY (P > 0.05). With FBR >6% (vs. 3–6% and 0–3%), FCE increased (1.53 vs. 1.43 and 1.39 ± 0.29 kg milk/kg DMI) and DMI reduced (22.43 vs. 23.65 and 24.43 ± 1.14 kg/d). Our
data shows the importance of FBR management to maximize FCE in commercial dairy farms. More appropriate FCE should be estimated using energy corrected milk.

**Key Words:** feed conversion, milk yield, feed bunk refusals

**T181** The effect of compost bedded pack or sand bedded freestall barns on milk thermoduric microorganism content. M. Borchers*,1, M. Morgan1, and J. Bewley2, 1University of Kentucky, Lexington, KY; 2CowFocused Housing, Bardstown, KY.

This study’s objective was to identify milk thermoduric microorganism population differences between compost bedded pack and deep sand bedded freestalls herds. Bulk tank milk samples were collected from herds housing cows exclusively on compost bedding (n = 10) or fresh sand bedding (n = 10) in the winter and summer of 2017. Three 9 mL bulk tank milk samples were pasteurized at 63°C for 30 min, 72°C for 15 s, or 135°C for 2 s. Fifty μL of milk was spiral plated on Plate Count Agar in duplicate. Plates were incubated at 35°C and 55°C for 24 h and 4°C for 10 d. Most probable number count was performed to determine growth <10 cfu/mL. Briefly, 1 mL milk was added to 3 tubes containing 9 mL Brain Heart Infusion Broth for each farm, pasteurization, and incubation combination. Inoculated broth was plated for isolation to determine growth. Morphologically unique colonies were isolated and identified using a Vitek 2 (bioMerieux, Hazelwood, MO, USA). Plate counts served as dependent variables and housing type as independent variables in a one-way ANOVA (Proc ANOVA, SAS v9.3; Cary, NC). Plate count results are shown in Table 1. Bacillus licheniformis was the only isolate from compost bedded pack milk. Bacillus coagulans, Bacillus licheniformis, Brevibacillus borstenlensis, and Paenibacillus polymyxa were isolated from sand bedded freestall milk. Compost bedding herds were not significantly greater than sand bedding herds in bulk tank milk thermoduric microorganism populations differences between compost bedded pack and deep sand bedded freestalls herds. Future analysis will investigate bedding type and skin thermoduric microorganism differences in bedding.

**Table 1 (Abstr. T181).** Results of a one-way ANOVA comparing milk thermoduric microorganism counts from compost bedded pack (CBP) barn and sand bedded freestall (SFS) barn herds

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Count (mean ± SD; cfu/mL)</th>
<th>P-value</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasturization</td>
<td></td>
<td>CBP</td>
<td>SFS</td>
</tr>
<tr>
<td>63</td>
<td>4</td>
<td>2.0 ± 6.4</td>
<td>0.0 ± 0.0</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>14.4 ± 17.6</td>
<td>10.3 ± 11.4</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>2.5 ± 4.0</td>
<td>1.3 ± 1.1</td>
</tr>
<tr>
<td>72</td>
<td>4</td>
<td>0.0 ± 0.0</td>
<td>0.0 ± 0.0</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>3.9 ± 4.8</td>
<td>15.8 ± 15.9</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>5.2 ± 9.4</td>
<td>1.3 ± 0.9</td>
</tr>
<tr>
<td>135</td>
<td>4</td>
<td>0.0 ± 0.0</td>
<td>0.0 ± 0.0</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>56.3 ± 136.9</td>
<td>25.7 ± 73.5</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>0.0 ± 0.0</td>
<td>0.0 ± 0.0</td>
</tr>
</tbody>
</table>

**Key Words:** thermotolerant, milk quality, pasteurization

**T182** Evaluation of a topical spray-on product for body temperature control in lactating Holstein cows. C. S. Takiya*1, B. E. Voelz1, S. E. Schuling2, D. E. Schimek2, L. G. Mendonça1, and B. J. Bradford1, 1Kansas State University, Manhattan, KS; 2NutriQuest, Mason City, IA.

Heat stress is a challenge for the US dairy industry, but few topical application strategies have been attempted to mitigate it. Sixty mid-lactation Holstein cows were used in a randomized block design experiment to evaluate impacts of a spray-on product on body temperature over 42 d. Cows were blocked by milk yield and coat color, and randomly assigned to treatments that differed in spray-on product quantity (200 or 300 mL) and application frequency (once on d 1, or twice, on d 1 and 24). The placebo treatment (300 mL water) was applied twice, providing a total of 5 treatments. Treatments were applied as an aerosol spray to both sides of the animal with a low volume, low pressure spray gun. Vaginal temperature (VT) was recorded every 5 min for 4 d beginning on d 9 and 30 using the ibutton/blank CIDR method. Infrared thermographic images (ITI) were taken from right and left side of rib cage of the cows 3 × wk in the evening during wk 2, 4, and 6. ITI of the eye and base of udder were also collected during wk 2 and 6. Statistical models included the fixed effect of treatment and the random effect of block, with repeated measures over time. Pearson correlation coefficients were calculated to compare paired VT and maximum and mean temperatures from ITI. THI exceeded 72 for 14 h/d during the study, suggesting that heat stress likely affected cows. During d 9–13 after initial treatment, spray-on product treatments increased VT relative to control (38.72, 28.86, and 38.86 ± 0.06°C for 0, 200, and 300 mL, respectively; P < 0.01), but no treatment differences were observed on VT on d 30 – 34 (6–10 d after the second treatment). Treatments had no effect on mean ITI temperature of the eye, the base of the udder, or over the ribs. Eyeball and udder ITI maximum temperature were positively correlated (P < 0.01; R = 0.39 and 0.29, respectively), whereas the mean ITI of udder and left side of rib cage were negatively correlated (P ≤ 0.046, R = −0.36 and −0.19) with VT. We observed no evidence that the spray-on product reduces body temperature of cows. Maximum temperatures from ITI of eye had a moderately positive relationship with VT.

**Key Words:** heat stress; infrared image, topical

**T183** Milk fatty acid profile and gene expression related to metabolism in mammary gland from cows fed two dietary zinc sources under heat stress. T. N. Marins*1, R. M. Orellana1, X. Weng1, A. P. A. Monteiro2, J. Guo3, J. K. Bernard1, D. J. Tomlinson2, J. M. DeFrein2, and S. Tao1, 1University of Georgia, Tifton, GA; 2Zinpro Corporation, Eden Prairie, MN.

Heat stress and dietary Zn source influence mammary function of lactating dairy cows but their impacts on milk fatty acid (FA) composition and mammary metabolism are largely unknown. The objective of this study was to evaluate milk FA profile and mammary gland gene expression related to energy metabolism of lactating cows fed 2 dietary zinc sources under 2 environments. Multiparous lactating Holstein cows (n = 72) were randomly assigned to 4 treatments with a 2 × 2 factorial arrangement. Treatments included 2 environments: cooled (CL) using fans and misters or non-cooled (NC), and 2 dietary zinc sources: 75 mg/kg of Zn hydroxychloride (IZ) or 35 mg/kg Zn hydroxychloride + 40 mg/kg Zn-Methionine complex (ZC). All cows were cooled for 84 d (temperature-humidity index = 73) and fed respective dietary treatments before the environmental challenge for the remaining 84 d (temperature-humidity index = 78) when NC cows were deprived of cooling. After the environmental challenge, milk samples were collected from 24 cows (6/treatment) at 3, 25, and 53 d to measure FA profile by gas chromatograph. Mammary tissue was collected from 32 cows (8/treatment) at 7 and 56 d for gene expression analysis by RT-qPCR. There were environment × Zn interactions for milk C4:0 and C8:0 (P = 0.01), but no environment × Zn interactions for C12:0. Compared with NC, CL cows had greater C12:0 (P = 0.01).

**Key Words:** milk composition; mammary expression; fatty acid
and ZC cows tended ($P = 0.06$) to have greater C12:0 than IZ. Relative to CL, NC cows had lower de novo ($P = 0.02$) but greater preformed FA ($>C16$, $P = 0.05$), and tended ($P = 0.10$) to have greater polyunsaturated FA. Compared with CL, mammary tissue from NC cows had greater ($P \leq 0.08$) gene expression of phosphofructokinase kinase-1 and 6-phosphogluconate dehydrogenase, but did not alter gene expression of FA synthase and lipoprotein lipase. In conclusion, dietary Zn source elicits different responses on milk short chain FA profile under different environments; heat stress increases preformed but decreases de novo FA, and may alter glycolysis and pentose pathway of the mammary gland.

**Key Words:** heat stress, milk fatty acid, mammary metabolism

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**T184 Evaluating the effects of Vista Pre-T on feed efficiency in heat-stressed dairy cattle.** A. E. Stone*, K. B. Graves, and S. Hardin, Mississippi State University, Starkville, MS.

The objective of this study, conducted between April 12 and September 1, 2017, at the Mississippi State University Bearden Dairy Research Center, was to evaluate the effect of Vista Pre-T (AB Vista, Marlborough, UK) on feed efficiency (FE) and milk components during heat stress. Cows ($n = 92$ Holsteins) were assigned to control (CON) and treatment (TRT) groups based on parity (1 or $\geq 2$), DIM, and milk yield. The same ration was fed except TRT was pre-treated according to manufacturer recommendations ($750$ mL per ton TMR dry matter). Cows were weighed and milk fat, protein, and lactose were tested weekly. Orts were weighed daily and FE was calculated by dividing energy corrected milk by dry matter intake. Reticulorumen temperature (RT) was obtained every $5$ min via bolus (Smartcex, GMBlH, Austria). Temperature humidity index (THI; Tycon Systems Inc., Bluffdale, UT) was obtained hourly. Milk yield was recorded at each milking. The MIXED procedure of SAS was used to determine the relationship between FE, milk components, milk yield, RT, SCC, and THI between groups. Treatment ($P < 0.01$), yield ($P = 0.02$), RT ($P < 0.01$), and THI ($P < 0.01$) had significant effects on FE. The TRT group was more feed efficient than CON ($1.54 \pm 0.02$ and $1.34 \pm 0.05$). Dry matter intake did not differ between CON and TRT ($69.07$ and $68.91$ kg/d; $P = 0.92$). Treatment ($P = 0.04$), RT ($P < 0.01$), and THI ($P = 0.05$) had significant effects on milk fat. The TRT group had higher fat than CON ($4.41 \pm 0.06$ and $4.02 \pm 0.14$%). Parity group, DIM, milk yield, weight, RT, and treatment ($P < 0.01$ for all) had significant effects on milk protein. Milk protein was greater in the TRT group compared with CON ($2.80 \pm 0.01$ and $2.68 \pm 0.03$). The CON group had lower lactose than TRT ($4.70 \pm 0.03$ and $4.85 \pm 0.01$; $P < 0.01$). The TRT group had lower SCC than CON ($154,170 \pm 15,994$ and $326,670 \pm 33,326$ cells/mL). Parity group ($P < 0.01$) and DIM ($P < 0.01$) also had significant effects on SCC. Treatment and CON groups did not differ in RT ($39.2^\circ C$ and $39.1^\circ C$, $P = 0.27$). Treatment did not have a significant effect on milk yield ($P = 0.55$), but THI did ($P = 0.02$). Vista Pre-T significantly improved FE, milk lactose, protein, fat, and SCC with no measured negative implications.

**Key Words:** dry off, management

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Dairy cows and foremost the Holstein-Friesian breed has more than doubled its milk yield over the last $40–60$ years. They often average more than $30$ L per day with some producing more than $60$ L during peak lactation. Due to flattening of lactation curves milk production levels before dry-off (DO) have also increased. The objective of this study was to describe the levels of milk production immediately before DO in $2$ European countries, France and Denmark. Milk production levels were collected at herd and animal level during a multicenter prospective cohort study including $558$ dairy cows from $37$ herds in France and $347$ cows from $21$ herds in Denmark. Herds were randomly selected. All cows dried-off during the study duration were included. Information on production parameters, feeding and management practices at herd and cow level were collected. Abrupt dry-off implied no prior change in either milking frequency or feeding regimen. Gradual dry-off implied any change in these routines. Levels of milk production varied across the included farms with in mean (SD) $7,795.3 (\pm 1,881)$ kg and $11,387.7 (\pm 2,394.8)$ kg in 305 d ECM in France and Denmark respectively. The information on how cows were dried-off at herd level (representing the overall management strategy at herd level) and at animal level (representing the actual included cows in the study) were collected. It must be highlighted how definitions of dry-off methodology were understood differently by farmers taking part in the study thus creating a large difference between the overall dry-off management at farm level and what was implemented at cow level. This study demonstrated high variability in dry-off methodologies applied at herd and animal level in France and Denmark. Among farms included $31$ from France and $6$ from Denmark indicated to perform an abrupt dry off versus $6$ respective $15$ a gradual dry off. At animal level $46.1\%$ and $32.6\%$ of cows were dried off abruptly versus $53.9\%$ and $67.4\%$ were dried off gradually in France and Denmark respectively. In both countries both a gradual and an abrupt dry off method was applied at animal level irrespective of major differences in milk production at both animal and herd level.

**Key Words:** feed efficiency, heat stress, Vista Pre T

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**T185 The choice of dry off procedure (abrupt/gradual) is not linked to milk production level.** K. Krogh*, N. Menudier, L. Meppiel, J.-F. Collin, A. de Prado-Taranilla, C. Mansanet, G. Pagny, B. Cuminal, and N. Isaka, Ceva Sante Animale, Libourne, France.

Dairy cows are dried off to allow for a sufficient dry period. Previous work has been focused at interaction between dry off procedures and udder health or welfare. Drying cows off gradually implies that cows will be exposed to a series of changes before the dry off that might be questionable. This work aims to investigate the practices used (feeding management and milking routine) to dry off cows in $2$ European Countries; France and Denmark and evaluate a possible association of dry off procedure with average milk production. Information on dry off management was collected at herd and animal level during a multicenter prospective cohort study including $558$ dairy cows from $37$ herds in France and $347$ cows from $21$ herds in Denmark. Herds were randomly selected. All cows dried-off during the study duration were included. Information on production parameters, feeding and management practices at herd and cow level were collected. Abrupt dry-off implied no prior change in either milking frequency or feeding regimen. Gradual dry-off implied any change in these routines. Overall, the milk production when the cows were dried off gradually decreased to $13$ to $14$ kg the day before dry off. Among the cows dried-off abruptly, the milk production the previous day of the dry-off differed between Denmark ($25.1$ kg) and France ($14.5$ kg). Populations from the $2$ countries varied in other parameters such as breed, parity and overall milk production level. These study demonstrate that the milk production cut-off to dry off cows differ among farmers in France and Denmark. While French farmers dry off cows gradually with in mean (SD) $14.4 (6.1)$ and abruptly $14.5 (5.3)$ kg milk/24 h, Danish
farmers dry cows off gradually with 13.4 (7.4) and abruptly 25.1 (10.8) kg milk/24 h. Milk production during the 24 h before the dry off were thus lower in cows included in France irrespective of the applied dry off method. A third (113 of 347 included cows) of the included Danish cows were dried off abruptly with more than 15 kg/24 h, which may be detrimental from an udder health perspective.

Key Words: dry off, management

T188 Milk replacer addition to whole milk in dairy calves: Effect on growth and starter intake. A. Bogni², C. Vissio³, N. Marchetto, and P. Turiello¹. 1 Facultad de Agronomía y Veterinaria UNRC, Río Cuarto, Córdoba, Argentina, 2Departamento Técnico Teknil SA; Río Cuarto, Córdoba, Argentina, 3Consultor privado, Río Cuarto, Córdoba, Argentina.

The objective of this study was to evaluate the effect of increasing the concentration of total solids in whole milk on growth and starter intake in Holstein calves. Sixty female calves were fed 4 L of colostrum at birth, blocked by dam parity (primiparous and multiparous) and randomly assigned to 1 of 4 treatments (n = 15) in a 2 × 2 factorial design. All calves were fed whole heat-treated milk under either a conventional (C, 4 L from d 1 to 49) or a step-up/step-down system (S, 4 L from d 1 to 7, 6 L from d 8 to 14, 8 L from d 15 to 28, 6 L from d 29 to 35, 4 L from d 36 to 49), divided into 2 equal feedings daily. Both systems were also tested with 0.5 kg/d of milk replacer powder (MR) during the first 30 d or without it. Treatments were C, C+MR, S, and S+MR. Starter and water were offered daily ad libitum from d 1. All calves were fed 2 L from d 50 to 56. Calves were weighed at birth and weekly until 53–59 d of age. Starter intake was calculated based on offered and remaining feed. The ANOVA procedure was used to determine the effect of treatment on BW, ADG and starter intake, and statistical differences were considered with a P-value < 0.05. No statistical differences in BW were detected at birth (37.3 ± 4.7 kg). MR supplementation increased by 8 kg the final BW of calves in S treatment but no differences between C+MR and S+MR were detected. MR supplementation increased ADG by 0.11 and 0.12 kg/d, in C and S treatments, respectively. Starter intake during the last week (d 50–56) was similar between treatments. In conclusion, total solid increment using MR during the first month showed a greater ADG during the entire liquid feeding period with no negative effect on starter intake. The use of C+MR is a simple method to obtain higher weight gains without the need to increase the volume of milk offered.

Key Words: dairy calf, growth, milk replacer supplementation

T189 Human-edible nutrient conversion and performance of cows fed a “zero land use” diet. C. S. Takiya*, A. Bennett, M. Davidson, C. M. Ylioja, and B. J. Bradford, Kansas State University, Manhattan, KS.

The sustainability of dairy industry has been challenged due to competition with humans for feed and arable land. We sought to evaluate whether cows could maintain milk yield and improve conversion of human-edible (HE) nutrients in feedstuffs into milk when fed a “zero land use” diet (ZLU) and rumen-protected amino acids (AA). Twelve multiparous cows were assigned to a 3 × 3 Latin square with 21-d periods. Cows were blocked by milk yield and were randomly assigned within block to the following treatments: (1) conventional lactation TMR (CON) with 26% co-products; (2) TMR composed of ZLU feedstuffs; and (3) ZLU with top-dressed AA [ZLU-AA; 77 g/d AjiPro-L (Ajinomoto, Chicago, IL) and 45 g/d MetaSmart (Adisseo, Antony, France)]. ZLU consisted of hay from the winter intercropping of triticale and red clover, wheat middlings, corn gluten feed, corn hominy, spent coffee grounds, whole cottonseed with lint, and molasses. Cows were milked twice/d and milk samples were analyzed on d 18–21 of each period. Maximum HE metabolizable energy (ME) and protein contents were estimated based on sugar, starch, true protein, and fat concentrations in corn grain (including in silage), corn hominy, soybean meal products, wheat middlings, and molasses. Other feedstuffs were considered unsuitable for human consumption. Statistical models accounted for the random effect of cow within square and fixed effects of treatment, period, and square. ZLU diets decreased DMI, milk and solids yields, and feed efficiency (Table 1). ZLU diets did not improve the recovery of HE ME, and worsened HE protein recovery. Avoiding the use of dedicated livestock feed does not necessarily improve recovery of HE nutrients, although assumptions about human ingredient use heavily influence these calculations.

Key Words: electric blanket, cow, heat stress
Table 1 (Abstr. T199).

<table>
<thead>
<tr>
<th>Item</th>
<th>CON</th>
<th>ZLU</th>
<th>ZLU-AA</th>
<th>SEM</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMI, kg/d</td>
<td>26.2a</td>
<td>22.4b</td>
<td>22.5b</td>
<td>0.63</td>
<td>*</td>
</tr>
<tr>
<td>Milk yield/DMI</td>
<td>1.21a</td>
<td>1.06b</td>
<td>0.99b</td>
<td>0.054</td>
<td>*</td>
</tr>
<tr>
<td>Milk yield, kg/d</td>
<td>31.9a</td>
<td>22.9b</td>
<td>22.9b</td>
<td>1.48</td>
<td>*</td>
</tr>
<tr>
<td>Fat, kg/d</td>
<td>1.13b</td>
<td>0.87b</td>
<td>0.89b</td>
<td>0.049</td>
<td>*</td>
</tr>
<tr>
<td>Protein, kg/d</td>
<td>1.02a</td>
<td>0.70b</td>
<td>0.75b</td>
<td>0.043</td>
<td>*</td>
</tr>
<tr>
<td>Lactose, kg/d</td>
<td>1.53a</td>
<td>1.03b</td>
<td>1.05b</td>
<td>0.073</td>
<td>*</td>
</tr>
<tr>
<td>Urea N, mg/dl</td>
<td>13.9ab</td>
<td>14.2a</td>
<td>13.7b</td>
<td>0.14</td>
<td>0.03</td>
</tr>
<tr>
<td>HE ME recovery in milk, %</td>
<td>0.64</td>
<td>0.65</td>
<td>0.63</td>
<td>0.029</td>
<td>0.90</td>
</tr>
<tr>
<td>HE protein recovery in milk, %</td>
<td>0.79a</td>
<td>0.42b</td>
<td>0.41b</td>
<td>0.035</td>
<td>*</td>
</tr>
</tbody>
</table>

*P < 0.001.

Key Words: by-product, sustainability

T190  Comparison of six handheld glucose meters used in dairy cows. R. Lopes*, A. Valldecabres, and N. Silva-del-Río, Veterinary Medicine Teaching and Research Center, University of California-Davis, Tulare, CA.

The objective of this study was to evaluate the suitability of 6 handheld meters for measuring glucose in dairy cows [Contour Next (CT), FreeStyle Precision Neo (FS) Nova Max Plus (NM), Aga Matrix (AM), Precision Xtra (PX), and Accu-Chek Aviva Plus (AC)]. Whole blood samples from 97 Jersey cows (71 for CT) were measured in triplicate immediately after collection using the 6 handheld glucose meters. Statistical analysis was performed using Medcalc v.18. Plasma glucose concentration by hexokinase enzymatic methodology was considered the reference methodology. Based on the intra-assay coefficient of variation (CV), precision varied across handheld glucose meters: AC (2.9%), CT (6.1%), PX (6.2%), FS (7.3%), AM (8.3) and NM (8.3%). Pearson correlation coefficients between the reference methodology and handheld glucose meters were 0.53 for AM, 0.67 for NM, 0.79 for FS, 0.82 for CT, 0.83 for PX and 0.85 for AC (P < 0.0001). Bland-Altman plots between each meter and the reference methodology resulted in a negative bias (FS = -4.2 mg/dL; CT = -10.7 mg/dL) or a positive bias (PX = 5.9 mg/dL; AM = 7.0 mg/dL; NM = 10.4 mg/dL; AC = 11.8 mg/dL). All handheld glucose meters fell within acceptable limits of agreement (1.96SD) at least 95% of the time (PX = 96%; AC = 96%; CT = 95%; AM = 95%; NM = 95%), except by FS (94%). Optimized thresholds were calculated by receiver operating characteristics (ROC) analysis using ≥60 mg/dL as the thresholds for hyperglycemia. Adjusted thresholds were 47.0 mg/dL for CT (Sensitivity [Se] = 92.1%, Specificity [Sp] = 72.7%), 51.3 mg/dL for FS (Se = 90.4%, Sp = 57.8%, 64.5 mg/dL for PX (Se = 76.9%, Sp = 73.3%), 69.7 mg/dL for AM (Se = 50.0%, Sp = 75.6%), 68.3 mg/dL for NM (Se = 73.1%, Sp = 60.0%), and 71.3 mg/dL for AC (Se = 75.0%, Sp = 75.6%). According to area under the ROC curve (AUC), CT had the highest accuracy, followed by AC (0.799), PX (0.790), FS (0.751), NM (0.690), and AM (0.616). CT and AC had a discriminatory power comparable to a previously validated handheld meter (PX), but precision was better for AC. For dairy cows, most meters will need be used with optimized threshold or be calibrated to improve accuracy.

Key Words: cow-side meter, glucose

T191  Forage in close-up rations: Type, inclusion rate, and dry matter adjustments. R. Lopes* and N. Silva-del-Río, Veterinary Medicine Teaching and Research Center, University of California-Davis, Tulare, CA.

The objective of the present study was to describe the type, inclusion rate (DM %), and frequency of DM adjustments of forages incorporated into the close-up recipe (CUR). Records from a 12-mo (n = 23) or 5-mo (n = 1) consecutive period were extracted from a herd feeding management software (FeedWatch 7.0). Enrolled dairies were located in California and ranged in size from 1,100 to 6,900 cows. The data set included the following variables: date, recipe type, recipe number, ingredient type, ingredient quantity, and ingredient DM. Descriptive statistics were conducted with MedCalc (v. 18). The median number of forages included in CUR ranged from 2 to 4 across dairies. Corn silage was used in 95% of dairies and alfalfa forages in 83% of dairies [hay (low K: 60%, unknown: 23%), haylage (8%), green chop (4%)]. Half of the dairies incorporated a combination of corn silage and alfalfa hay as the sole sources of forage in CUR. Other forages included in CUR were oat hay (25%), wheat straw hay (25%), wheat silage (12%), and sorghum silage (8%). Across dairies, forage inclusion in CUR ranged from 45 to 90%, with most dairies (70%) including at least 65% of forage. Within dairy, forage inclusion varied over time; it increased up to 2 to 38% from Q10 to Q90. Corn silage inclusion in CUR was <40% (8%), 40 to 60% (56%), and >60% (34%). Within dairy, corn silage inclusion varied, increasing 4 to 77% from Q90 to Q90. Alfalfa hay inclusion in CUR averaged <30% (20%), 30 to 40% (30%), 40 to 50% (40%) and >50% (10%). On dairies with 12-mo data set (n = 23), DM adjustments for corn silage were performed 0 (17.3%), 3 to < 6 (26.0%), 6 to < 12 (30.4%) or ≥12 (26.0%) times per year. For corn silage, adjustments in DM represented a change of 1.5 to 10% in percentage units of DM. DM adjustments for alfalfa hay were observed 0 (85%) or 1 (15%) time per year; the changes made were of 0.3 to 3 percentage units. Overall, in our study forage inclusion rate varied within and across dairies. Alfalfa forages were used on most dairies but only 60% recorded alfalfa as low K. There seems to be an opportunity to increase the frequency of DM adjustments for corn silage on dairies.

Key Words: forage, DM analysis, dairy cow

T192  The effect of hygiene score on somatic cell count of cows reared in a compost bedded pack dairy barn. F. Alpay1, C. Únal*1, E. Çavuşoğlu1, I. M. Abdourhamane1, M. Efî2, D. Dinçel1, M. Ogan1, and S. Dikmen1, 1Department of Animal Science, Uludag University, Faculty of Veterinary Medicine, Bursa, Turkey, 2Department of Animal Nutrition, Uludag University, Faculty of Veterinary Medicine, Bursa, Turkey.

Compost bedded pack barn type is an alternative housing system for dairy cows and fairly new design for Turkish dairy farmers. The objective of this study was to determine the effect of hygiene score on somatic cell scores of lactating Holstein cows reared in a compost bedded pack barn system in Turkey. A total of 8,438 records of 1,068 lactating Holstein cows were used for this study. Milk samples were collected fortnightly from the cows to determine SCC, fat, lactose, protein, nonfat solids, total solids, casein, urea, freezing point, density and acidity in milk. Cow hygiene was measured using a 4-point scoring system (very clean, clean, dirty, and very dirty) for 3 different areas of the cow’s body (leg, flank, and udder) and combining these scores to generate a composite cleanliness score. Hygiene score of different body parts of each cow were recorded on the day of milk sampling. Milk composition, SCS, and milk yield data were analyzed with using PROC MIXED model of SAS. The effects of parity (1–6), stage of lactation (early, mid and late lactation),...
season (spring, summer, autumn, and winter), year (2014, 2015), level of milk production (high and low) and hygiene score were determined as the fixed effects and the effect of cow within each hygiene score was included as a random factor in the model. Results showed that only leg (P < 0.01) and udder (P < 0.001) hygiene scores were significantly changed the somatic cell score. On the other hand, the effects of parity (P < 0.001), level of milk production (P = 0.001), stage of lactation (P < 0.001) and season (P < 0.001) were also significant on somatic cell score of cows reared in compost bedded pack barn. In conclusion, leg and udder hygiene scores were significantly associated with SCS and also during the summer months, high producing dairy cows had highest SCS especially when they are in early stage of lactation.

**Key Words:** somatic cell count, hygiene score, compost bedded barn

**T193 Automated body condition scoring: Evaluation of the effects of BCS around calving on metabolic disease.** C. M. Truman1, I. L. Mullins1, M. L. Falk1, J. M. Bewley2, and J. HC Costa*1, 1University of Kentucky, Lexington, KY; 2CowFocused Housing, Bardstown, KY.

Body condition scoring (BCS) is a non-invasive way to measure the amount of fat present on the cow’s body. Cows with low or high BCS are at a higher risk of developing metabolic disease and decreased reproductive performance. The objective of this study was to evaluate the effect of automated collected BCS around calving on subclinical and clinical disease outcomes. This study was conducted from September 2016 to September 2017 on a 3,200-cow commercial dairy in Indiana. Subclinical ketosis and milk fever status were determined for each cow from one blood sample taken ≤7 DIM. Blood was analyzed for BHB and calcium concentrations. Positive subclinical cases of ketosis and milk fever were classified at ≥1.2 mmol/L BHB and <8.6 mmol/L calcium, respectively. Clinical disease data, for metritis, milk fever, and ketosis, were collected by farm personnel and recorded electronically. Daily BCS was recorded automatically, on a 1 to 5 scale, from an automated BCS camera (DeLaval International AB, Tumba, Sweden) throughout lactation and retrieved electronically. The technology has shown to be equivalent to manual scoring (r = 0.77, P < 0.001). Using Pearson correlation procedure, BCS at calving, dry-off, and test day had no correlation with subclinical concentrations of BHB and calcium. Odds of subclinical and clinical disease cases were determined by binary logistic regression. Cows with a BCS ≥3.75 at dry-off had increased odds of having a positive subclinical ketosis case (OR = 3.62; CI: 1.33, 9.86; P < 0.01). For every 0.3 BCS gain from calving to 7 DIM, cows were 35% less likely to develop metritis ≤14 DIM (OR = 0.65; CI: 0.53, 0.80; P < 0.01). Displaced abomasum ≤150 DIM was less likely in cows at heavier condition, as BCS increased by 0.2, at 21 DIM (P < 0.01). Assessment of BCS using an automated system may be a useful measure to alert for the risks of metabolic diseases around calving.

**Key Words:** overcrowding, OmniGen-AF, health

**T195 Does the training of nulliparous cows to use a robotic milking system influence their milk yield and milking frequency?** M. Peiter*1, M. H. O. Pasetti2, J. A. Salfer3, and M. I. Endres1, 1University of Minnesota, St. Paul, MN; 2University of São Paulo-ESALQ, Piracicaba, SP, Brazil; 3University of Minnesota Extension, St. Cloud, MN.

Robotic milking systems (RMS) have attracted growing interest from dairy producers in the last few years in the United States, but the amount of research data available is limited. It has been observed that it takes some time for cows to adjust to the RMS, especially primiparous cows. Therefore, the objective of this study was to compare daily milk yield and milking frequency (number of milkings/d) between primiparous cows introduced to the RMS without any previous exposure (2016) and cows trained to access the RMS before calving for the first time (May–Nov 2017). The training was performed in a case study dairy farm 2×/d for approximately 15 d pre-partum by physically bringing cows to the RMS milking station, where they were offered 1 kg of a concentrate pellet/visit. Eight stages of lactation were evaluated: 1–7, 8–14, 15–21, 22–30, 31–60, 61–90, 91–150, and 151–210 DIM. Data were analyzed using PROC MIXED (SAS 9.4); stage of lactation and year as fixed effects and cow as random effect. Daily milk yield (n = 31,828 cow-d) was greater for trained cows at all the stages of lactation; a stage × yr interaction was detected (P < 0.001). Milk yield (not trained and trained cows, respectively) was 16.6 and 19.3 kg (1–7 DIM); 23.0 and 28.6 kg (8–14 DIM); 27.7 and 32.3 kg (15–21 DIM); 30.2 and 35.7 kg (22–30 DIM); 33.4 and 38.3 kg (31–60 DIM); 35.4 and 38.3 kg (61–90 DIM); 34.7 and 37.2 kg (91–150 DIM); 32.7 and 36.4 kg (151–210 DIM). Milkling frequency followed the same pattern and was greater at all stages of lactation for trained heifers; a stage × yr interaction was detected (P < 0.001). Number of milkings/d (not trained

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and trained cows, respectively) was 1.82 and 2.12 (1–7 DIM); 1.88 and 2.62 (8–14 DIM); 2.05 and 2.94 (15–21 DIM); 2.16 and 3.27 (22–30 DIM); 2.24 and 3.44 (31–60 DIM); 2.45 and 3.12 (61–90 DIM); 2.51 and 3.15 (91–150 DIM); 2.46 and 3.01 (151–210 DIM). Training nulliparous cows to the RMS before calving appeared to affect milk yield and milking frequency. However, more research is yet needed to further investigate this management practice on RMS farms.

**Key Words:** robotic milking, milk yield, milking frequency

**T196 A comparison of milk yield and milking frequency of primiparous versus nulliparous cows in a robotic milking system**

M. Peiter*1, M. H. O. Pasetti2, and M. I. Endres1,

1University of Minnesota, St. Paul, MN, 2University of São Paulo-ESALQ, Piracicaba, SP, Brazil, 3University of Minnesota Extension, St. Cloud, MN.

The objective of this study was to compare daily milk yield and milking frequency (number of milkings/d) of nulliparous (LACT 1) and multiparous (LACT 2+) cows in a robotic milking system (RMS) at various stages of lactation. Data were collected daily for 2016 and from May–Nov 2017 from a case study farm that implemented training of nulliparous animals to the RMS in Jan 2017. Training was performed 2×/d for 15 d prepartum by physically bringing them to the RMS milking station. Ten stages (S) of lactation were evaluated: 1–7 (S1), 8–14 (S2), 15–21 (S3), 22–30 (S4), 31–60 (S5), 61–90 (S6), 91–150 (S7), 151–210 (S8), 211–270 (S9), and 271–330 (S10) DIM (S1, S3, S5, S10 are reported). Data were analyzed within year using PROC MIXED (SAS 9.4), with stage of lactation and parity as fixed effects and cow as random. Daily milk yield in 2016 (n = 82,466 cow-d) was greater for LACT 2+ cows for most lactation stages but not late lactation; an S × LACT interaction was detected (P < 0.001). Milk yield (LACT 1 and 2+, respectively) was 18.7 and 28.1 kg (S1); 29.8 and 46.1 kg (S3); 35.5 and 52.2 kg (S5); 28.5 and 27.7 kg (S10). Daily milk yield in 2017 (n = 69,178 cow-d) followed a similar pattern with an S × LACT interaction detected (P < 0.001). Milk yield (LACT 1 and 2+, respectively) was 19.3 and 29.6 kg (S1); 32.4 and 47.6 kg (S3); 38.2 and 53.8 kg (S5); 29.7 and 29.5 kg (S10). Milking frequency in 2016 was greater for LACT 2+ cows most of lactation but not late lactation; an S × LACT interaction was detected (P < 0.001). Number of milkings/d (LACT 1 and 2+, respectively) was 1.94 and 2.47 (S1); 2.18 and 3.37 (S3); 2.37 and 3.05 (S5); 2.36 and 2.15 (S10). In 2017, LACT 1 cows had a higher milking frequency than LACT 2+ cows starting at S5, whereas in 2016 this only occurred at S9. Number of milkings/d (LACT 1 and 2+, respectively) was 2.13 and 2.71 (S1); 2.98 and 3.61 (S3); 3.45 and 3.44 (S5); 2.45 and 2.39 (S10). It appears that this change in management may result in improved primiparous cow performance in RMS. However, further research with a more direct comparison is warranted.

**Key Words:** robotic milking, milk yield, milking frequency

**T197 Claw measures of Jersey cows: An anatomy study.** L. T. Passos*1,2, V. Fischer3, J. Adaska1,3, and N. S. De-Rio1,

1Veterinary Medicine Teaching and Research Center, University of California-Davis, Tulare, CA, 2Federal University of Rio Grande do Sul, Postgraduate Animal Science Program, Porto Alegre, RS, Brazil, 3California Animal Health & Food Safety Lab, Tulare, CA.

Hoof trimming is a common practice on dairy operations to treat and prevent lameness. However, more information on claw anatomy of Jersey (JE) cows is needed before trimming guidelines can be developed for this dairy breed. The objective of this study was to describe anatomical structures of cadaver claws from JE cows. Rear claws (n = 39) from 8 primiparous and 12 multiparous JE cows with 5 to 277 DIM were collected from 3 commercial dairies in California. The following measurements were performed in intact claws: sole width (SW), heel height (HH), dorsal wall length (DWL), sole thickness (ST) and dorsal wall angle (DWA). Measurements were obtained using a precision goniometer (±0.3°) and caliper (±0.01 mm). Each toe was divided sagitally using a band saw to measure ST at the apical margin of distal phalanx. Descriptive statistics were performed with the Proc MEANS and UNIVARIATE of SAS (version 9.4). Results (means, range) are shown in Table 1. The lateral toe was 7% wider than the medial toe in primiparous cows whereas in multiparous cows lateral toe was 1.4% longer and 13.5% wider than the medial toe. Based on industry-wide recommendations the DWL should never be trimmed below 75 mm to ensure ST of at least 7 mm and the DWA should be within 45° to 52°. In our study, primiparous cows had toes with DWL <75 mm (93.8%), ST <7 mm (46.8%) and DWA within 45° to 52° (59.3%). Multiparous cows had toes with DWL <75 mm (32.7%), ST <7 mm (39%) and DWA within 45° to 52° (58.6%). There are thin soles in JE. More studies are needed before trimming guidelines are developed for JE cows.

**Key Words:** Jersey, claw anatomy, hoof trimming

**T198 Effects of a conventional diet or total mixed ration diet offered to Korean female cattle on blood metabolites.** B. Kim*1,

M. Kim1, S. A. Fenila1, G. Son3, B. Park2, and J. Shin1,

1Kangwon National Univ., Chuncheon, Kangwondo, South Korea, 2Nonghyup Feed Research Institute, Seoul, South Korea.

This study was aimed to compare the change of blood metabolites of Korean female cattle offered either a conventional diet (CON) or a total mixed ration (TMR) diet for 6 mo in prepartum. Twenty-two Korean female cattle (about 27 mo old) were randomly assigned to one of 2 diets and 2 sample t-tests were conducted; CON, concentrate (3kg/hd/day) + rice straw (unlimited) or TMR, (6.6kg/hd/day). The TMR offered per cow per day was composed of concentrate, maize silage, grass, molasses, and rice straw. The DM, CP and TDN intakes were not significantly affected by any of diet groups, but the tendency for higher DM, CP and TDN were observed. Data were analyzed within year using PROC MIXED and UNIVARIATE of SAS (version 9.4). Results (means, range) are reported). Daily milk yield in 2016 (n = 82,466 cow-d) was greater for LACT 2+ cows most of lactation stages but not late lactation; an S × LACT interaction was detected (P < 0.001). Milk yield (LACT 1 and 2+, respectively) was 19.3 and 29.6 kg (S1); 32.4 and 47.6 kg (S3); 38.2 and 53.8 kg (S5); 29.7 and 29.5 kg (S10). Milking frequency in 2016 was greater for LACT 2+ cows most of lactation but not late lactation; an S × LACT interaction was detected (P < 0.001). Number of milkings/d (LACT 1 and 2+, respectively) was 1.94 and 2.47 (S1); 2.18 and 3.37 (S3); 2.37 and 3.05 (S5); 2.36 and 2.15 (S10). In 2017, LACT 1 cows had a higher milking frequency than LACT 2+ cows starting at S5, whereas in 2016 this only occurred at S9. Number of milkings/d (LACT 1 and 2+, respectively) was 2.13 and 2.71 (S1); 2.98 and 3.61 (S3); 3.45 and 3.44 (S5); 2.45 and 2.39 (S10). It appears that this change in management may result in improved primiparous cow performance in RMS. However, further research with a more direct comparison is warranted.

**Key Words:** robotic milking, milk yield, milking frequency

**Table 1 (Abstr. T197).** Descriptive statistics of measurements from 39 JE claws, mean (range)

<table>
<thead>
<tr>
<th>Claw</th>
<th>Parity</th>
<th>SW (mm)</th>
<th>DWL (mm)</th>
<th>HH (mm)</th>
<th>ST (mm)</th>
<th>DWA (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral</td>
<td>1</td>
<td>46 (40–52)</td>
<td>69 (61–77)</td>
<td>26 (19–33)</td>
<td>6.8 (3.1–10.4)</td>
<td>50 (41–59)</td>
</tr>
<tr>
<td></td>
<td>&gt;1</td>
<td>48 (44–55)</td>
<td>73 (67–80)</td>
<td>27 (20–35)</td>
<td>7.8 (4.8–11.3)</td>
<td>48 (41–58)</td>
</tr>
<tr>
<td>Medial</td>
<td>1</td>
<td>43 (37–51)</td>
<td>69 (62–80)</td>
<td>23 (42–58)</td>
<td>6.8 (4.8–9.6)</td>
<td>50 (42–58)</td>
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<td>&gt;1</td>
<td>43 (39–50)</td>
<td>72 (67–77)</td>
<td>22 (15–30)</td>
<td>7.5 (3.6–11)</td>
<td>48 (39–57)</td>
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T199  Characterization of the rumen microbiome resilience throughout lactation and its association with gross feed efficiency in Holstein dairy cows. Z. Zhou1, P. M. Peixoto1, M. S. Gomes1, E. R. Bonsaglia1, I. F. Canisso1, J. L. Stewart1, F. C. Cardoso2, and F. S. Lima3,1 Department of Veterinary Clinical Medicine, University of Illinois, Urbana, IL, 2 Department of Animal Sciences, Urbana, IL.

The objectives of this study were to characterize the rumen microbiome throughout lactation and its association with gross feed efficiency in a cohort of Holstein cows. Rumen samples were collected using an oro-esophageal-ruminal sampling device (Flora Rumen Scoop; Prof's Product, Guelph, Canada) at d 7, 21, 50, 90, and 130 d postpartum in a cohort of 18 primiparous Holstein cows. Animals were housed in a barn with tiestalls fed the same diet during the entire study. Rumen samples 16S rRNA genes were sequenced using the MiSeq platform. The Shannon richness and diversity index did not change (P = 0.90) samples 16S rRNA genes were sequenced using the MiSeq platform. The discriminant analysis did not show differences over time. The predominant phyla throughout lactation were Firmicutes, Tenericutes, Proteobacteria, and Spirochaetes with mean relative abundance (MRA) of 43.0%, 40.9%, 3.4%, 3.4%, and 2.8%, respectively. The only change over time for phyla was an increase (P < 0.01) of the MRA at d 90 for the phylum Tenericutes that returned to normal at d 130 postpartum. The predominant genera were Prevotella, Butyryrivibrio, Treponema, Shuttleworthia, Bulleida, Ruminococcus, RFN20, Clostridium, Coprococcus, and Fibrobacter with MRA of 25.7%, 3.8%, 2.7%, 2.3%, 2.3%, 2.2%, 2.2%, 1.8%, 1.6%, and 1.5%, respectively. The MRA for RFN20 was greater at d 50, 90 and 130 than in d 21 and 27 postpartum. Treponema tended to be increased at d 90 postpartum when compared with the other time points evaluated. Gross feed efficiency (GFE), calculated as energy corrected milk over dry matter intake, was categorized as Low (<1.32) or High (≥1.32). Discriminant analysis revealed differences between Low and High GFE. Cows with high GFE had greater MRA for Bulleida (P = 0.02) and a tendency for greater MRA for Butyryrivibrio than Low GFE. Also, Treponema MRA was lower in High GFE (P < 0.01) than Low GFE cows. The current data suggest that rumen microbiome is resilient throughout the lactation and cows categorized as Low GFE and HIGH GFE host a different rumen microbial population.

Key Words: rumen microbiome, gross feed efficiency, resilience

T200  Effects of recombinant bovine somatotropin supplementation on periparturient dairy cows. M. S. F. Zoni1, L. F. Moroz2, A. F. Sica3, R. L. Araujo3, R. C. Chebel4, and R. de Almeida*1, 3 Universidade Federal do Paraná, Curitiba, PR, Brazil, 2 Frank Anna Farm, Carambeí, PR, Brazil, 3 Colorado Farm, Araras, SP, Brazil, 4 University of Florida, Gainesville, FL.

Recombinant bovine somatotropin (rbST) could be an important tool to improve immune status and to optimize health in transition dairy cows. Therefore, the objective of this study was to investigate the effects of rbST on productive and metabolic parameters of periparturient dairy cows. The trial was conducted in 2 commercial herds in Paraná and São Paulo States, Southern Brazil, from September 2016 to August 2017. A total of 692 heifers and cows were blocked by lactation order and body condition score 28 d before calving. The Treatment group 1 was supplemented weekly with 0.6 mL (125 mg) of bovine somatotropin (Boostin®; Merck) only in the prepartum period, the Treatment group 2 was supplemented weekly with 0.6 mL (125 mg) of rbST both in the prepartum and postpartum periods until the 21th day after calving, while the Control group received 0.6 mL of saline until the 21th day after calving. Three blood samples were collected on d 0, 6, and 13 postpartum. Data were analyzed using the MIXED procedure of SAS with a model containing the effects of farm, calving order, time, treatment, and treatment*time interaction as fixed effects and cow within treatment as a random effect. Average milk yield in the first 100 d of lactation did not differ (40.66 kg/d in the Control, 40.66 kg/d in rbST prepartum, and 39.98 kg/d in rbST pre- and postpartum; SEM = 1.6 kg/d, P = 0.61) among experimental groups. Analysis of metabolites on serum blood in the day of calving (NEFA, Ca, albumin, cholesterol, triglycerides, GGT and AST) did not demonstrate (P > 0.10) any beneficial effects of rbST supplementation, however the analysis of β-hydroxybutyrate (BHB) on serum blood in the 6th and 13th day after calving showed an increase (P < 0.05) in fat mobilization in the groups with rbST administration. These results suggest an increase in the incidence of clinical and subclinical ketosis, especially in the Treatment group 2 (rbST supplementation pre- and postpartum). In summary, rbST supplementation in the prepartum and immediate postpartum periods did not show positive results in this trial.

Key Words: health, performance, transition period

T201  Microorganisms isolated from subclinical intramammary infections present in dairy cattle from the southeast United States. K. Enger2, C. Petersson-Wolfe2, R. A. Almeida1, D. T. Nolan3, P. D. Krawczel1, J. Bewley6, A. E. Stone4, S. H. Ward5, S. P. Oliver1, and G. M. Pighetti1, 1 University of Tennessee, Knoxville, TN, 2 Virginia Polytechnic Institute and State University, Blacksburg, VA, 3 University of Kentucky, Lexington, KY, 4 Mississippi State University, Starkville, MS, 5 North Carolina State University, Raleigh, NC, 6 Cow-Focused Housing, Bardstown, KY.

The predominant microorganisms that cause subclinical and clinical intramammary infections (IMI) can vary with environmental conditions, personnel, and management practices. However, limited information exists regarding the types of organisms isolated from subclinical IMI of dairy cattle in the southeast US. To address this limitation, members of the Southeast Quality Milk Initiative identified 30 herds in KY (n = 9), MS (n = 3), TN (n = 9), and VA (n = 9) that were participating in Dairy Herd Improvement programs and willing to participate. The top 10–20 cows with the highest SCC according to the most recent DHI test were selected for sampling at each farm visit (2–3 times per year, Jan 2016 to Jan 2018). Quarter milk samples were collected aseptically and stored at −20°C until cultured. Culture and organism identification were performed as outlined by NMC. Overall, 1,847 cows and 5,710 quarters were sampled. Of these, 647 (11.3%) were considered contaminated with either bacillus or 3+ colonies of different morphology and 2411 (42.2%) exhibited no growth. After removing these samples, 2,652 quarter samples contained 1 (99.5%) or 2 (5%) bacterial isolates. The dominant organisms isolated included coagulase-negative staphylococci (CNS; 38.9%), Staphylococcus aureus (15.6%), Streptococcus dysgalactiae

(7.6%), Esculin positive streptococci including *Streptococcus uberis* (7.3%) and *Escherichia coli* (5.3%). The following organisms each accounted for 1 to 3.5% of the isolates: *Staphylococcus hyicus*, *Serratia*, *Corynebacterium*, *Klebsiella*, *Enterococcus*, yeast, and *Aerococcus* species. CNS and *S. aureus* were the 2 most isolated organisms on 16 of 30 farms. Closer examination of a subset of CNS isolates, revealed 41 of 61 (67%) were *Staphylococcus chromogenes*. This suggests that *S. chromogenes* may be a more frequent cause of subclinical IMI with high SCC than *S. aureus*. Staphylococcal species, including *S. aureus*, represent the predominant isolates from high SCC cows in the southeast and strategies to prevent or minimize new infections with these organisms should be a part of mastitis control programs in the southeast US.

**Key Words:** mastitis, dairy cattle, microorganisms

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**T202 Microorganisms isolated from subclinical intramammary infections present in cattle managed on organic dairy farms in the southeast United States.** G. M. Pighetti*,1, V. L. Couture1, H. R. Bailey1, A. Rius1, P. D. Krawczel1, and S. R. Smith2, 1University of Tennessee, Knoxville, TN, 2University of Kentucky, Lexington, KY.

The predominant microorganisms that cause subclinical and clinical intramammary infections (IMI) can vary with environmental conditions, personnel, and management practices. However, limited information exists regarding the types of organisms isolated from subclinical IMI of dairy cattle in the southeast United States. To address this limitation, 5 certified organic herds in KY and TN that were participating in Dairy Herd Improvement programs and willing to participate were enrolled in the study. The top 10–20 cows in the herd with the highest SCC according to the most recent DHI test were selected for sampling at each farm visit (4–6 times per year, Mar 2017 to Nov 2017). Quarter milk samples were collected aseptically and stored at −20°C until cultured. Culture and organism identification were performed as outlined by NMC. Overall, 168 cows and 1,230 quarters were sampled. Of these, 27 (2.1%) were considered contaminated with either bacillus or 3+ colonies of different morphology and 685 (55.7%) exhibited no growth. After removing these samples, 518 quarter samples contained 1 (92%) or 2 (8%) bacterial isolates. The dominant organisms isolated included coagulase-negative staphylococci (CNS; 26.2%), *Staphylococcus aureus* (17.0%), *Staphylococcus hyicus* (15.4%), *Corynebacterium bovis* (12.1%), and *Streptococcus uberis* (10.2%). Closer examination of a subset of CNS isolates, revealed 67 of 106 (63%) were *Staphylococcus chromogenes*. Corynebacterium species other than *C. bovis* and *Streptococcus dysgalactiae* accounted for 2.5 and 3.5% of the isolates, respectively. The predominant species on each farm varied considerably, with CNS and *S. aureus* most frequently isolated on 2 herds, CNS and *S. hyicus* on a third, *C. bovis* and *S. uberis* on a fourth, and CNS, *C. bovis* and *S. aureus* on a fifth. This suggests local environments and management practices significantly influence dominant types of organisms associated with IMI. Strategies to prevent or minimize new infections with these organisms should be a part of mastitis control programs on organic dairy farms in the southeast US.

**Key Words:** mastitis, organic dairy, microorganisms