**T170** Effect of culling rates on profitability of dairy herds achieving the same pregnancy rate. G. M. Schuemann*1, K. N. Galvão2, S. Borchardt3, W. Heuwieser4, and P. Federico4, 1Department of Veterinary Preventive Medicine, The Ohio State University, Columbus, OH, 2Department of Large Animal Clinical Sciences, University of Florida, Gainesville, FL, 3Clinic for Animal Reproduction, Faculty of Veterinary Medicine, Free University of Berlin, Berlin, Germany, 4Department of Mathematics, Computer Science and Physics, Capital University, Columbus, OH.

Objective was to assess the effect of each unit increment of culling (CULL) from 25 to 43% on profitability of dairy herds achieving 20% pregnancy rate (PR) using a cow-based model. Same reproductive program was used, Presynch-Ovsynch with estrus detection (ED) and timed-artificial insemination (TAI) with a voluntary waiting period of 60 d in milk (DIM). Probability of involuntary CULL was set at 0.1% per d for the first 60 DIM, and 0.03% per d for the remaining of the lactation and dry period. Probability of death was set at 0.05% per d for the first 60 DIM, and 0.0076% per d for the remaining of the lactation and dry period. Herd size was set to 1,000 cows and each unit of CULL was modeled using the same TAI-ED to achieve 20% PR. Four factors affecting the economic benefits of dairy herds remain unchanged for the simulation: (1) milk price ($0.37 per kg), (2) feed prices for lactating ($0.25 per kg of dry matter [DM]) and dry cows ($0.15 per kg of DM), (3) cull cow price ($1.00/kg of live weight), and (4) replacement price ($1,600 per heifer). Conception to first service was set at 32% and then decreased by 2.6% for every subsequent abortion. Abortion was set at 9.3% for the first 90 DIM and at 1.7% for the remaining of gestation. Cows were not bred after 366 DIM and open cows were culled after 450 DIM. Simulation was performed until steady state was reached (3,000 d), and then average daily values for the subsequent 2,000 d were used to calculate profit/cow/yr. Net daily value was calculated by subtracting the costs (replacement, feeding, breeding, and other costs) from the daily income (milk sales, cow sales, and calf sales). Higher CULL reduced (P < 0.05) the proportion of cows with lactations ≥ 3, increased replacement costs, and reduced profit by $186 per cow/yr. For each unit increment of CULL, the proportion of first lactation cows increased by 0.66 percentage points and the proportion of net profit decreased by 1.09 percentage points. On average, it took 53 mo to reach the breakeven point considering the heifer replacement cost to first calving and the subsequent milk revenues over 3 consecutive lactations. Excessive CULL increased the proportion of first lactation cows and replacement costs; thus, reducing profitability.

**Key Words:** culling, economics, dairy

---

**T171** Factor screening for prediction of retention-pay offs of dairy cows using standardized regression coefficients, random forests, and the method of elementary effects. A. Beyi* and A. De Vries, University of Florida, Gainesville, FL.

A dairy cow retention pay-off (RPO) of individual cows may be used to support culling decisions. Sensitivity analyses regarding herd inputs (factors) that affect RPOs are generally carried out with a one-factor-at-a-time design and typically include only the change in the average RPO. Our objective was therefore to carry out a formal, systematic sensitivity analysis of herd factors as recommended in the literature. RPOs were generated using a stochastic dynamic programming model (DairyVIP) using 15 herd inputs. Each combination of herd input variables resulted in 2,304 RPO for cow categories, a combination of lactation number, month in milk, and relative milk yield. We used Standardized Regression Coefficients (SRC), Random Forests (RF), and Morris’ method of Elementary Effects (EE) to investigate the importance of the 15 factors. Data for SRC and RF were calculated using independent Monte Carlo variations of the 15 herd variables within preset ranges (n = 320 runs with DairyVIP). Data for EE were calculated with the “economical design” of the original Morris study using 4 levels per factor and 20 replicates (n = 320 runs). The 5 output variables were average RPO and change in herd profit, as well as Spearman’s rank correlation coefficient, root mean squared error, mean absolute error compared with the set of RPOs using default herd inputs. Results for the 5 rescaled variables were averaged. All 3 methods ranked heifer price as the most important factor. The methods did not agree on the rankings of most of the other factors. Replacement heifer price, milk price, and price per body weight of replaced cow were the 3 most important variables based on RF and EE. Using EE, the ranking of the 7 most important herd inputs was heifer price, milk price, price per live body weight, calf price, relative milk production, relative body weight, feed price. We concluded that the 3 methods may result in different rankings of herd input factors. The EE method is recommended in the literature and warrants wider use in sensitivity analysis in dairy sciences.

**Key Words:** elementary effect, sensitivity analysis

---

**T172** Prediction of dairy cow retention pay-offs with k-nearest neighbors methods. A. Beyi* and A. De Vries, University of Florida, Gainesville, Florida.

Dairy cow retention pay-offs (RPO) are typically calculated with a dynamic programming (DP) model. Alternatively, a large data set of pre-calculated RPO might be useful if it can predict the RPO of cows in new herds with sufficient accuracy. Objective was to investigate k-nearest neighbor (KNN) methods to predict RPO for new herds. Given a set of herd input variables, 2,304 RPO were calculated for non-pregnant cows varying by parity, month in milk, and relative level of milk yield with a DP model. We calculated the RPO for 500 sets of input variables which varied by heifer price, calf price, and body weight price. Mean of RPO in the 500 sets was $71 (min -$429, max $4,017). The data were divided into a training collection (450 sets) and a test collection (50 sets). The KNN method calculates similarity by (weighted) Euclidian distance between the inputs in the test collection and those in the training collection and selects those k = 5 training sets with the best similarity. The RPO for each test set were predicted by 3 variants of KNN: simple average of 5 RPO (KNNs), average of 5 RPO (KNNa), and simple average of 5 RPO using weights from a linear regression of the 3 predictors (KNNw). Performances were assessed by similarity measures of the 2,304 RPO in the test set and the predicted RPO: root mean square error (RMSE), relative absolute error (RAE), and minimum and maximum prediction errors. Results are in the Table 1. Although average prediction errors were sufficiently small, some large prediction errors remained. In conclusion, K-Nearest Neighbors Methods and a large RPO data set may produce sufficiently accurate RPO without the need of a DP model.

**Key Words:** data mining, k-nearest neighbors

---

**Production, Management, and the Environment II**
T173Sources of variation in feed conversion in commercial dairy farms of Argentina. R. A. Palladino*1, C. Magliola1, E. Giugge1, C. Chiavassa2, J. L. Monge3, M. P. Turiello4, and F. Bargo1, 1Universidad Buenos Aires, Buenos Aires, Argentina, 2Grupo Chiavassa, Carlos Pellegrini, Santa Fe, Argentina, 3Universidad Nacional de Villa María, Villa María, Córdoba, Argentina, 4Universidad Nacional de Río Cuarto, Río Cuarto, Córdoba, Argentina.

Feed conversion (FC) is key to understand income over feed costs in dairy farms; however, FC is highly variable in commercial farms due to the multiple management factors involved. A 5-year (2012 to 2016) data set from 4 pens (early and mid-lactation multiparous cows, early and mid-lactation primiparous cows; n = 7300) from a commercial dairy farm (Chiavassa Dairy Farm, Argentina; −32° 02′ 60″ S, −61° 47′ 59″ W) was used to investigate which performance and feed management variables affect FC variability. Variables were recorded daily and included: milk yield (MY, kg/d), dry matter intake (DMI, kg/d), FC (kg milk/kg DM), and TMR DM content (%TMRDM). For the complete set of 5-year, coefficient of variation (CV) between days (i.e., from previous to current day or −1 d vs. 0 d) was then estimated for each of those variables. Individual MY was recorded by ALPROTM (DeLaval) and averaged by pen. DMI was estimated by difference between feed offered and refused, divided by the number of cows per pen. Offered TMR and ors DM content was determined in a forced-air oven for 2 h at 135°C. Holstein cows were milked 3x/d and fed 2x/d with a TMR (corn silage, alfalfa silage, alfalfa hay, corn grain, soybean meal, minerals, premix; 49.8 ± 1.1% DM, 15.8 ± 0.9% CP, 29.9 ± 5.3% NDF, 3.9 ± 0.3% ether extract, and 2.89 ± 0.15 Mcal ME/kg DM; mean ± SD). Partial correlations (r, calculated using the MANOVA/PRINTE commands of PROC GLM of SAS version 9.3, SAS Institute Inc., Cary, NC) evaluated association between CV of FC and the other variables. The model included year, month, and pen. Coefficient of variation of FC was highly and positively correlated (P < 0.01) with CV of DMI (r = 0.90) and CV of MY (r = 0.34). It was also positively correlated (P < 0.01) but to a lesser extent with FC (r = 0.25), CV of %TMRDM (r = 0.08), and %TMRDM (r = 0.04). On the other hand, CV of FC was negatively correlated (P < 0.01) with DMI (r = −0.24) and MY (r = −0.07). Our data show that FC variability could be reduced by reducing daily variation in DMI and increasing DMI.

Key Words: feed conversion, variability, feed bunk management

T174Effect of stocking rate on feeding strategies and individual milk production of autumn calving grazing dairy cows. D. Custodio1, G. Ortega1, Y. Lopez1, T. Nuñez1, D. Custodio1, R. Mello1, and P. Chilibroste*2, 1Agronomy Faculty, Animal Science Department CRS, Progreso, Canelones, Uruguay, 2Agronomy Faculty, Animal Science Department, Grass Production and Utilization on Grazing Systems, EEMAC, Paysandú, Paysandú, Uruguay.

A farmlet study was conducted to determine the effect of stocking rate on feeding strategies and individual milk production of autumn calving grazing dairy cows. Four farmlets (2 per treatment) representing a pasture based dairy system in Uruguay, which combines annual with perennial pastures under a 4-yr rotation, were grazed either with 1.5 (MSR) or 2.0 (HSR) milking cows per hectare from June to December 2016. Ninety-six cows were randomized to the farmlets based on parity (3.3±1.3), BW (500±91) and BCS (2.95±0.87). Every week, the number of daily grazing sessions (0, 1, or 2), the amount of roughage offered, the amount of concentrate feed in the milking parlor and the individual milk production and composition were recorded. Grazing rules were the same for the 4 farmlets, as well as the amount of concentrate feed to each individual cow. The amount of roughage offered and the addition or not of soybean hull as a diet corrector, were defined for each farmlet based on sward allowance and the number of grazing sessions. The data were analyzed with a mixed model that included stocking rate and month as fixed effects and farmlet as a random effect. The repeated measurement was week and an autoregressive covariance structure (order 1) was selected for all responsive variables. Differences were declared significant when P < 0.05. Individual milk production was not different between treatments (24.4±0.6) though HSR cows ate more silage (2.7 vs 2.1 kgDM/d), hay (1.2 vs 0.8 kgDM/d) and soybean hull (1.2 vs 0.83kgDM/d) than MSR cows. Mean concentrate intake was 5.5±0.09 kgDM/d. MSR cows had higher herbage allowance (15.4 vs 13.4 kgDM/d) than HSR cows. Besides, MSR cows were able to graze a larger proportion (0.72 vs 0.65) and were forced to stay in the fed pad a shorter proportion (0.28 vs 0.35) of the total eating time. We concluded that under well-managed pastures, increasing stocking rate will affect diet composition and feeding strategy, which ultimately might have more negative side effects on long-term dairy system performance.

Key Words: stocking rate, milking cows, feeding strategies

T175Effect of stocking rate at system level on produced and harvested forage. G. Ortega1, Y. Lopez1, T. Nuñez1, D. Custodio1, R. Mello1, and P. Chilibroste*2, 1Agronomy Faculty, Animal Science Department CRS, Progreso, Canelones, Uruguay, 2Agronomy Faculty, Animal Science Department, Grass Production and Utilization on Grazing Systems, EEMAC, Paysandú, Paysandú, Uruguay.

A farmlet study was being conducted to determine the effect of stocking rate on feeding strategies and individual milk production of autumn calving grazing dairy cows. Four farmlets (2 per treatment) representing a pasture based dairy system in Uruguay, which combines annual with perennial pastures under a 4-yr rotation, were grazed either with 1.5 (MSR) or 2.0 (HSR) milking cows per hectare from June to December 2016. Ninety-six cows were randomized to the farmlets based on parity (3.3±1.3), BW (500±91) and BCS (2.95±0.87). Every week, the sward mass of each individual plot in each farmlet was assessed through the double sample technique (Haydock and Shaw, 1975). Based on these observations, mean growth rate (GR, kgDM/ha/day) for each paddock and the whole farmlet was estimated. The grazing area was adjusted weekly based on the GR registered for each treatment. Cows grazed a daily strip with a mean herbage allowance of 15.4 and 13.4 kgDM/d over 6 cm for MSR and HSR, respectively. Before and after grazing,

Table 1 (abstract T172). Performance results of 50 test sets with the 3 k-nearest neighbors (KNN) methods

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Min</th>
<th>Mean</th>
<th>Max</th>
<th>Min</th>
<th>Mean</th>
<th>Max</th>
<th>Min</th>
<th>Mean</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMSE</td>
<td>2.14</td>
<td>15.22</td>
<td>42.29</td>
<td>1.37</td>
<td>12.88</td>
<td>40.24</td>
<td>0.86</td>
<td>12.03</td>
<td>36.90</td>
</tr>
<tr>
<td>RAE</td>
<td>0.36%</td>
<td>2.96%</td>
<td>11.49%</td>
<td>0.27%</td>
<td>2.50%</td>
<td>9.84%</td>
<td>0.13%</td>
<td>2.35%</td>
<td>7.75%</td>
</tr>
<tr>
<td>Min error</td>
<td>−213</td>
<td>−37</td>
<td>4</td>
<td>−180</td>
<td>−31</td>
<td>3</td>
<td>−131</td>
<td>−25</td>
<td>7</td>
</tr>
<tr>
<td>Max error</td>
<td>−8</td>
<td>29</td>
<td>132</td>
<td>−7</td>
<td>26</td>
<td>129</td>
<td>−5</td>
<td>27</td>
<td>157</td>
</tr>
</tbody>
</table>
mean sward height and the phenologic stage of the pastures were registered in each individual grazing session. The data were analyzed with a mixed model that included stocking rate and month as fixed effects and farmlet as a random effect. The repeated measurement was week, and an autoregressive covariance structure (order 1) was selected. Differences were declared significant when $P < 0.05$. Cows on HSR grazed a larger amount of grass (825.3 vs 517.2 kg DM/month/ha) than MSR. Sward mass (1772 vs 1750 kg DM/ha) and GR (50.2 vs 53.2 kg DM/ha/day) did not differ significantly between treatments. Accumulated grass harvested was 4761 kg DM/ha for MSR (76% grazing; 24% haylage) and 5777 kg DM/ha for HSR (100% grazing). Accumulated milk production per hectare was different (7654 vs 10760 L for MSR and HSR, respectively). We concluded that when good grazing management practices are applied, increasing stocking rate will not affect mean stock of pasture or growth rate. However, according to stocking rate, the ratio between direct (grazing) and mechanical (mowing) harvesting will be affected.

Key Words: stocking rate, growth rate, milking cows

T176 Milk yield and somatic cell score of northeastern United States organic dairy farms during the grazing and non-grazing seasons. J. G. B. Galvão Jr.*,1, A. F. Brito2, A. H. N. Rangel3, J. B. A. Silva4, A. F. Benson5, A. N. Hafla6, H. M. Darby7, K. J. Soder8, and R. Kersbergen9, Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Norte, Ipanguacu, RN, Brazil, 1University of New Hampshire, Durham, NH, 2Universidade Federal do Rio Grande do Norte, Natal, RN, Brazil, 3Universidade Federal do Semiárido, Mossoro, RN, Brazil, 4Cornell University Cooperative Extension, Cortland, NY, 5USDA-ARS, University Park, PA, 6University of Vermont, St. Albans, VT, 7University of Maine, Orono, ME.

The objective of this study was to evaluate milk yield and composition of organically-certified dairy herds during the grazing season (GS) and non-grazing season (NGS) in the Northeastern region of the United States. Dairy Herd Improvement records of Holstein, Jersey, and Holstein-Jersey crossbred cows from May 2012 to June 2015 were obtained monthly from 14 herds in the states of New Hampshire (n = 3), Vermont (n = 3), Maine (n = 3), New York (n = 2), and Pennsylvania (n = 3). The length of GS averaged 160 d (May to November). A total of 14,246 observations including milk yield, 4% fat-corrected milk (FCM), concentrations of milk fat and true protein, and somatic cell score (SCS) were obtained. Seasonal effects (GS vs. NGS) were compared using the PROC GLM procedure of SAS. Herds averaged (mean ± SD) 38 ± 18 lactating cows, 21.3 ± 8.04 kg/d of milk, 21.7 ± 7.52 kg/d of FCM, 4.26 ± 0.98% milk fat, 3.28 ± 0.45% milk true protein, and 2.54 ± 1.80 SCS. Days in milk was similar and averaged 143 ± 89 (GS) and 152 ± 85 (NGS). All milk variables (mean ± SEM) analyzed herein were affected by season, except SCS, which averaged 2.50 ± 0.04 vs. 2.52 ± 0.03 for the GS and NGS, respectively. Milk yield (22.0 ± 0.15 kg/d vs. 20.8 ± 0.12 kg/d, FCM (22.1 ± 0.14 kg/d vs. 21.4 ± 0.12 kg/d), and concentration of milk true protein (3.32 ± 0.01% vs. 3.29 ± 0.01%) were greater during the GS than NGS, which may be explained by improved forage nutritional value when comparing pasture with conserved feeds. Milk fat concentration was greater in the NGS (4.35 ± 0.01%) vs. GS (4.17 ± 0.02%). This increased milk fat concentration may have been caused by replacing pasture for conserved feeds with greater fiber content, or by a dilution effect caused by decreased milk volume (~1.20 kg of milk/d) during the NGS. Herd SCS suggest adequate year-round milking procedures and preventative mastitis protocols. However, farmers should adopt better supplementation strategies or implement forage-crop practices that improve conserved feed nutritional value to mitigate milk yield losses during the NGS.

Key Words: grazing season, milk somatic cell score, organic dairies

T177 Dairy calf management—A comparison of practices and producer attitudes among conventional and organic herds. J. Pempek*, G. Schuenemann, E. Holder, and G. Habing, The Ohio State University, Columbus, OH.

Dairy calves are at high risk for morbidity and mortality early in life. Understanding producer attitudes is important for the implementation of best-management practices to improve calf health. The objectives of this study were to evaluate usage frequency and producer attitudes on key calf management practices between conventional and organic dairy operations. A cross-sectional survey was mailed to conventional and organic dairy producers in Ohio and Michigan, USA that included questions on cow-calf separation, colostrum management, and vaccination use. The overall survey response rate was 49% (727/1488); 449 and 172 conventional and organic producer respondents, respectively, were included in the final analysis. Binary, cumulative, and multinomial logistic regression models were used to test differences within and between herd types for management practices and producer attitudes. The majority of conventional (64%, 279/439) producers reported separating the calf from the dam 30 min to 6 h after birth. More organic (34%, 56/166) than conventional (18%, 80/439) producers reported separation 6 to 12 h after birth, and organic producers were more likely to agree that time before separation is beneficial. Few conventional (10%, 44/448) and organic (3%, 5/171) producers reported measuring colostrum quality. Most conventional producers (68%, 304/448) hand-fed the first feeding of colostrum, whereas the majority of organic producers (38%, 69/171) allowed calves to nurse colostrum. Lastly, 44% (188/430) of conventional producers reported vaccinating their calves for respiratory disease, compared with 14% (22/162) of organic producers; organic producers were more likely to perceive vaccines as ineffective and harmful to calf health. Thus, the usage frequency and perceived risks and benefits of calf management practices vary considerably between conventional and organic dairy producers. These findings provide helpful information to understand decision making at the herd-level regarding key calf management and health practices, regardless of production systems.

Key Words: calf health, cow-calf separation, colostrum

T178 Milk yield distribution within pens in commercial dairy farms. P. Turiello*,1, C. Vissio1,2, S. Derado Mulleady1, F. Bargo3, A. Larriestra1, and A. Relling4, 1University Nacional de Río Cuarto, Río Cuarto, Córdoba, Argentina, 2CONICET, Río Cuarto, Córdoba, Argentina, 3Universidad de Buenos Aires, Buenos Aires, Argentina, 4Ohio State University, Wooster, OH.

The knowledge of milk yield distribution (average and standard deviation) is important in diet formulation to avoid the high-producing cows to be underfed. The objective of this experiment was to compare milk yield (MY) distribution using different measurement frequency. We characterizedfarm and pen MY distribution and compared distributions having monthly or daily records. Individual daily MY records from 2 commercial dairy farms in Argentina from year 2016 were used. Both farms had similar grouping criteria: hospital, fresh, first lactation, high and low producing cows. Hospital pens were excluded from the descriptive analysis. Day 15 of each month was selected arbitrary as the monthly record. Monthly MY were compared with daily MY records in a total of 8 pens (pens with less than 50 cows were not analyzed) from both dairy
A key regulator of smooth muscle contractions, and has been previously used in studies with cows available for analysis using the SNPassoc package in R. One study using BEAGLE, with a final set of 52,890 genotypes for 1,326 Holstein cows, found that the correlation between milk yield and the genetic marker ME305 milk was −0.0986. An association analysis revealed that cows with increased levels of clinical mastitis. Therefore, the key is to identify cows ideal for an automatic milking system. Tremblay et al. (2016; J. Dairy Sci. 99:5671–5680) showed that herds’ AMS production data and management information could be characterized in a meaningful way using cluster analysis and that this clustering approach yielded improved peer groups of farms than benchmarking methods based on criteria such as country, region, breed, or herd and region. The 6 clusters (i.e., peer groups) represent different management styles, unique goals or specific challenges and these peer groups could be used to distribute specialized advice to large groups of AMS producers at once (Tremblay et al., 2016). In addition, when using the cluster analysis peer groups, comparisons among farms lead to a more accurate representation of a farm’s strengths and weaknesses. For example, a cluster 5 farm with an average milk speed of 2.94 kg/min would be in the 90th percentile when compared with all 529 farms. This might give the producer an exaggerated sense of achievement but when compared with only cluster 5 farms, this farm would become in the 77th percentile, which could potentially motivate the farmer to set higher goals. Cluster analysis allows general recommendations to be produced for all farms within a cluster, and for individual farms to generate more appropriate goals by comparing themselves to farms within their own cluster.

**Key Words:** automatic milking systems; benchmarking; cluster analysis

### Table 1 (abstract T178). Milk yield (MY) distribution summarized by farm

<table>
<thead>
<tr>
<th>Farm</th>
<th>Milking cows</th>
<th>Pens</th>
<th>Mean MY, kg (SD)</th>
<th>Range in mean MY, kg</th>
<th>Range in pen MY, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>480</td>
<td>4</td>
<td>27.9 (8.74)</td>
<td>19.7–32.3</td>
<td>5.67–9.30</td>
</tr>
<tr>
<td>B</td>
<td>1,505</td>
<td>8</td>
<td>32.1 (8.02)</td>
<td>25.0–44.3</td>
<td>7.12–12.11</td>
</tr>
</tbody>
</table>

**Key Words:** milk distribution, diet formulation, grouping

### T179 Using DHI electronic milk weights to improve farm management.

H. Adams* and R. Fourdraine, CRI International Center for Biotechnology, Mt. Horeb, WI.

As the popularity of robotic milking continues to increase, so has the need to breed cows that exhibit traits that are directly related to maximizing the return of the robotic milking unit. Selection based on milk output includes not only high production, but also fast parlor throughput. However, previous research has associated faster milking cows with increased levels of clinical mastitis. Therefore, the key is understanding the relationships between milk output components and production and udder health to produce the most parlor-efficient cows. Since 2009 AgSource (Verona, WI) has utilized Tru-Test (Tru-Test Inc., Mineral Wells, TX) electronic milk meters (EMM). EMMs are calibrated and used to collect monthly DHI milk weights, milking durations and milk samples. Using actual measures of milking speed (MS) from the EMMs removes bias introduced by the subjective visual classification of cows into MS categories. To investigate the impact of MS on areas of production and health, test day records (n = 681,029) were extracted from the AgSource DHI database. Data were used from cows with complete individual and sire IDs, and if at least 2 records existed where milk duration was less than 20 min, and MS less than 9kg/min. When categorizing cows into MS classes by increments of 0.5 kg/min, SCC was high for slow and fast milkers, but lowest for those milking 2.5 kg/min. Correlation between MS and ME305 milk was 0.9963, and between MS and average somatic cell count (SCC) was −0.0986. An association study was conducted to identify potential markers associated with MS. Genotypes on cows within the AgSource database were imputed to 50K using BEAGLE, with a final set of 52,890 genotypes for 1,326 Holstein cows available for analysis using the SNPpassoc package in R. One marker was identified as significantly (FDR-corrected P < 0.03) associated with MS. The marker, located on BTA28 within gene KCNMA1, is a key regulator of smooth muscle contractions, and has been previously associated with breast cancer proliferation in humans. This candidate gene could be potentially beneficial in marker-assisted selection schemes to identify cows ideal for an automatic milking system.

**Key Words:** milk speed, parlor efficiency, DHI milk recording

### T180 Improved AMS benchmarking using cluster analysis.

M. Tremblay*1, J. P. Hess1, B. M. Christenson1, K. K. McIntyre1, B. Smink2, A. J. van der Kamp3, L. G. de Jong3, and D. Döpfer1, 1University of Wisconsin-Madison, Madison, WI, 2Lely North America, Pella, IA, 3Lely International N.V., Maassluis, the Netherlands.

Automatic milking systems (AMS) are implemented in many different environments and situations around the world. To streamline management advice and recommendations to many producers at once, individual farming practices and challenges need to be identified. Benchmarking is often used in the dairy industry to compare farms’ performance by computing percentile ranks of the production values of groups of farms. Grouping of farms for conventional benchmarking is frequently limited to the use of a few common factors such as farms’ geographic location or breed of cattle. Tremblay et al. (2016; J. Dairy Sci. 99:5671–5680) showed that herds’ AMS production data and management information could be characterized in a meaningful way using cluster analysis and that this clustering approach yielded improved peer groups of farms than benchmarking methods based on criteria such as country, region, breed, or herd and region. The 6 clusters (i.e., peer groups) represent different management styles, unique goals or specific challenges and these peer groups could be used to distribute specialized advice to large groups of AMS producers at once (Tremblay et al., 2016). In addition, when using the cluster analysis peer groups, comparisons among farms lead to a more accurate representation of a farm’s strengths and weaknesses. For example, a cluster 5 farm with an average milk speed of 2.94 kg/min would be in the 90th percentile when compared with all 529 farms. This might give the producer an exaggerated sense of achievement but when compared with only cluster 5 farms, this farm would become in the 77th percentile, which could potentially motivate the farmer to set higher goals. Cluster analysis allows general recommendations to be produced for all farms within a cluster, and for individual farms to generate more appropriate goals by comparing themselves to farms within their own cluster.

**Key Words:** automatic milking systems; benchmarking; cluster analysis

### T181 Factors associated with increased milk production in automatic milking systems.

M. Tremblay*1, J. P. Hess1, B. M. Christenson1, K. K. McIntyre1, B. Smink2, A. J. van der Kamp3, L. G. de Jong3, and D. Döpfer1, 1University of Wisconsin-Madison, Madison, WI, 2Lely North America, Pella, IA, 3Lely International N.V., Maassluis, the Netherlands.

Tremblay et al. (2016; J. Dairy Sci. 99:3824–3837) analyzed many data from North American dairy farms with automatic milking systems (AMS) for (risk) factors associated with increased milk production per cow and per robot per day. The final data set contained 54,065 observations from 529 farms collected from 2011 to 2014. The dependent variables of milk production per cow per day and milk production per robot per day were used in multivariable generalized mixed linear regression models with farm IDs as random effects and 2-way interactions selected using forward selection (Tremblay et al., 2016). Many variables and combinations of variables (interaction terms) were found to be significantly associated with the outcomes including traffic type (how cows are allowed to move among the AMS, feeding alley and...
lying stalls) and the number of AMS robots per pen (Tremblay et al., 2016). On average, free traffic type produced 67.21 kg (CI: 48.6–86.0) more milk per robot per day than Guided/Select; having one AMS robot per pen produced 59.82 kg (CI: 50.4–68.8) less milk per robot per day than having 2 AMS robot per pen; a AMS farm will produce 20.5 kg (CI: 17.0–24.4) of milk per robot more after 4+ years since installation compared with within the first year since start-up; Holsteins produce 216.71 kg (CI: 193.2–239.9) more milk per robot per day than Jerseys (not energy corrected) (Tremblay et al., 2016). Knowing how different factors affect milk production in AMS will help guide current and future AMS producers looking to maximize milk production and compare their performance to other AMS farms (Tremblay et al., 2016).

**Key Words:** automatic milking systems, milking robot, milk production

**T182** Estrus detected by activity monitors within 30 DIM is associated with estrus expression and fertility outcomes at first AI in lactating Holstein cows. A. M. L. Madureira*1, L. B. Polsky1, B. F. Silper1, T. A. Burnett1, J. L. M. Vasconcelos2, and R. L. A. Cerri1, 1University of British Columbia, Vancouver, BC, Canada, 2Sao Paulo State University, Botucatu, SP, Brazil.

The aim of this study was to evaluate the association between estrus’ physical activity at 2 moments (before 30 DIM and at first AI) on ovulation rate and pregnancy per AI (P/AI). A total of 436 lactating Holstein cows were enrolled. Cows were monitored by a pedometer (Afitag, Afimilk). Ovulation was induced by a timed AI protocol based on estradiol and progesterone. Body condition score (BCS; 1 to 5 scale) was measured at the time of AI (d 0) and the ovaries were scanned on d+7 to check for the presence of a corpus luteum. Calving score and prevalence of endometritis were recorded. Estrus was determined as relative increase (RI) in activity >100% of the cow’s baseline activity, within the first 30 DIM (30D) and at AI. At estrus, physical activity was categorized as high (<300%RI) and low (<300%RI). Pregnancy was diagnosed at d+30. Data were analyzed using MIXED and GLIMMIX procedures of SAS. Relative increase in activity (mean ± SE) was 274.1 ± 97.3% at 30D estrus and 494.9 ± 159.6% at AI estrus. Low BCS (≤2.75) tended to affect relative increase of activity at 30D (P = 0.09) and at AI (P = 0.12). Milk production was not correlated with increased physical activity (r = 0.06; P = 0.20); multiparous had lower activity than primiparous at AI (477.9 ± 11.3% vs. 513.1 ± 12.3%; P = 0.04). Cows with endometritis and dystocia had lower activity at 30D estrus compared with those that were healthy or did not experience dystocia (204.3 ± 21.9% vs. 285.7 ± 8.9%; 213.8 ± 26.9% vs. 282.3 ± 13.0%). Cows that had one estrus by 30 DIM had greater P/AI (47.5% vs. 32.8%; P < 0.05) and greater relative increase in activity at AI (533.1 ± 14.8% vs. 477.7 ± 9.9%; P < 0.05) compared with cows with no 30D estrus. Cows with estrus expressed at AI had greater fertility (43.6% vs. 22.8%; P < 0.05) and greater ovulation rates (94.8% vs. 85.7%; P = 0.03); Cows with increased activity at both 30D and AI were more likely to ovulate (98.8% vs. 91.6%; P = 0.01) and had greater P/AI (52.7% vs. 32.9%; P < 0.01) compared with those that did not express estrus at either period. Increase in physical activity at 30D and at AI improved fertility and ovulation rates.

**Key Words:** estrus, pregnancy, estrus expression, pedometer

**T184** A case study of composting process establishment in a new compost bedded pack barn housing lactating dairy cattle. M. Borchers*, J. Taraba, and J. Bewley, University of Kentucky, Lexington, KY.

The objective of this study was to describe compost establishment factors in a new compost bedded pack barn. The barn had 2 bedded areas (Side 1: 557 m²; Side 2: 595 m²) bedded with kiln-dried sawdust at a minimum compost temperature). Carbon content decreased and nitrogen temperatures on both sides exceeded 43.3°C at 20.3 cm depth (accepted minimum compost temperature). Carbon content decreased and nitrogen

**T183** An evaluation of technology-recorded rumination and feeding behaviors in dairy heifers. M. A. Myers1,2, J. A. Davidson2, M. R. Borchers3, C. M. Bradley2, and J. M. Bewley3, 1Department of Animal Science, University of Nebraska-Lincoln, Lincoln, NE, 2Purina Animal Nutrition Center, Gray Summit, MO, 3Department of Animal and Food Sciences, University of Kentucky, Lexington, KY.

Precision dairy monitoring technologies have become increasingly popular for recording rumination and feeding behaviors in dairy cattle. The objective of this study was to validate the rumination (RM) and feeding time (FT) functions of the CowManager SensOor (Agis, Harmelen, Netherlands) against visual observation. The study was conducted in the Heifer Innovation Unit at the Purina Animal Nutrition Center in Gray Summit, Missouri. The study took place over a 44 d period beginning June 1st, 2016. Holstein heifers (n = 49) were split into 2 groups based on age, diet, and housing type. Group 1 heifers (n = 24) were approximately 2 ± 2.69 mo in age, fed hay and starter, and housed on a straw bedded pack. Group 2 heifers (n = 25) were approximately 17 ± 1.33 mo in age, fed a TMR, confirmed pregnant, and housed in free stalls. Visual observation shifts occurred at hours 1500, 1700, 1900, and 2100, lasting for 1 h. Each heifer was observed for 2, 1h periods with both observation periods occurring on the same day. Visual observations were collected using a satellite-synced watch and a “start” and “stop” time were recorded. Concordance correlations (CCC; epiR package; R Foundation for Statistical Computing, Vienna, Austria) and Pearson correlations (r; CORR procedure; SAS Institute Inc., Cary, NC) were used to calculate association between visual observations and technology-recorded behaviors. The visually observed RM was correlated with the CowManager SensOor (r = 0.63, CCC = 0.55). Visually observed FT was also correlated with the CowManager SensOor (r = 0.88 CCC = 0.72). A difference of technology-recorded data from visual observation was treated as the dependent variable in a mixed linear model (MIXED procedure of SAS). Time of day, age in months, and group were treated as fixed effects. Individual heifers were treated as random and repeated effects. Fixed effects were not significant (P ≥ 0.05) on the difference of SensOor data from visual observation. Based on these results, the CowManager Sensoor was more effective at recording feeding behavior than rumination behavior in dairy heifers.

**Key Words:** rumination, feeding behavior, precision dairy monitoring
content increased consistently throughout this same period, indicating sufficient composting of bedding and animal waste.

**Key Words**: compost bedded pack barn, compost, temperature

### T185 Variables associated with milk yield and rumination time of Holstein cows housed in compost bedded pack barns. J. L. Monge*1, G. Clemente1, F. Clemente1, M. L. Zingaretti1, E. Giugge2, C. Chiavassa3, M. P. Turiello3, A. Palladino4, and F. Bargo4

Our objective was to investigate which feed and housing management variables were associated with milk yield (MY) and rumination time (RT) in a compost bedded pack barn (CBPG). We used a data set from 2 pens of primiparous (PP) or multiparous (MP) Holstein cows from a commercial dairy farm in Argentina (Chiavassa Dairy Farm; −32°02′60″ S, 61°47′59″ W). Variables evaluated included: DM intake (DMI), TMR DM content, feed bunk orts percentage (FBO), TMR particle size distribution (PSD), and cow stocking density (CSD, m²/ cow). All variables were recorded daily from May 2015 to December 2016. Milk yield (ALPRO, DeLaval) and RT (Heatime HR System, SCR) were averaged daily by pen and DMI was estimated by difference between feed offered and refused. The TMR PSD was measured using the 4-sieves PennState Particle Separator. The TMR DM content was determined with a forced-air oven for 2 h at 135°C. Cows were milked 3×/d and fed 2×/d with a TMR composed by corn silage, alfalfa silage, alfalfa hay, corn grain, soybean meal, and mineral premix that averaged 49.8 ± 1.1% DM, 15.8 ± 0.9% CP, 29.9 ± 5.3% NDF, and 2.89 ± 0.15 Mcal ME/kg DM (mean ± SD). We run Pearson correlations (r; R Core Team, www.r-project.org) to evaluate association between MY and RT, and the 5 variables. Milk yield was positively correlated (P < 0.01) with DMI (r = 0.50 for PP, r = 0.49 for MP), TMR DM content (r = 0.27 for PP, r = 0.28 for MP), RT (r = 0.24 for PP, r = 0.38 for MP), and CSD (r = 0.08 for PP, r = 0.37 for MP). Rumination time was positively correlated (P < 0.01) with 19 to 8 mm-sieve percentage (r = 0.45 for PP, r = 0.48 for MP), but it was negatively correlated (P < 0.01) with 8 to 1.18 mm-sieve percentage (r = −0.32 for PP, r = −0.28 for MP). Our results show that milk yield of Holstein cows housed in CBPG was positively associated with key feeding management variables such as DMI and TMR DM content but also with housing management variables such as CSD. On the other hand, RT was affected more by TMR PSD due to feed mixing management.

**Key Words**: compost bedded-pack barn, milk yield, rumination time

### Table 1 (abstract T184). Bedded pack and barn descriptive statistics from a 2-sided compost bedded pack barn

<table>
<thead>
<tr>
<th>Variable</th>
<th>Day 1 Side 1</th>
<th>Day 1 Side 2</th>
<th>Day 15 Side 1</th>
<th>Day 15 Side 2</th>
<th>Day 30 Side 1</th>
<th>Day 30 Side 2</th>
<th>Day 77 (final) Side 1</th>
<th>Day 77 (final) Side 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.3 cm depth temperature (°C)</td>
<td>19.0</td>
<td>21.0</td>
<td>28.3</td>
<td>32.5</td>
<td>41.8</td>
<td>45.0</td>
<td>44.5</td>
<td>47.4</td>
</tr>
<tr>
<td>10.2 cm depth temperature (°C)</td>
<td>19.0</td>
<td>21.0</td>
<td>9.2</td>
<td>10.9</td>
<td>20.8</td>
<td>20.1</td>
<td>25.0</td>
<td>25.5</td>
</tr>
<tr>
<td>pH</td>
<td>5.0</td>
<td>5.3</td>
<td>7.9</td>
<td>7.7</td>
<td>8.8</td>
<td>8.6</td>
<td>8.5</td>
<td>9.2</td>
</tr>
<tr>
<td>Moisture (%)</td>
<td>8.0</td>
<td>8.0</td>
<td>35.0</td>
<td>34.0</td>
<td>36.0</td>
<td>40.0</td>
<td>31.0</td>
<td>40.0</td>
</tr>
<tr>
<td>Carbon (DM %)</td>
<td>48.5</td>
<td>48.4</td>
<td>45.6</td>
<td>45.2</td>
<td>37.5</td>
<td>41.4</td>
<td>23.6</td>
<td>30.0</td>
</tr>
<tr>
<td>Nitrogen (DM %)</td>
<td>0.1</td>
<td>0.1</td>
<td>0.4</td>
<td>0.5</td>
<td>0.7</td>
<td>0.9</td>
<td>1.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Mean daily air temperature (°C)</td>
<td>19.3 ± 3.0</td>
<td>9.3 ± 2.4</td>
<td>15.2 ± 2.4</td>
<td>24.4 ± 3.0</td>
<td>15.2 ± 2.4</td>
<td>24.4 ± 3.0</td>
<td>24.4 ± 3.0</td>
<td>24.4 ± 3.0</td>
</tr>
<tr>
<td>Mean daily relative humidity (%)</td>
<td>64.1 ± 18.2</td>
<td>80.6 ± 10.4</td>
<td>83.2 ± 11.9</td>
<td>82.3 ± 10.1</td>
<td>83.2 ± 11.9</td>
<td>82.3 ± 10.1</td>
<td>83.2 ± 10.1</td>
<td>82.3 ± 10.1</td>
</tr>
<tr>
<td>Mean daily wind speed (m/s)</td>
<td>2.9 ± 1.5</td>
<td>5.1 ± 2.8</td>
<td>3.2 ± 2.0</td>
<td>2.7 ± 1.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### T186 Factors of cow comfort associated with herd-level reproductive outcomes on Canadian dairy farms. T. A. Burnett*1, R. Westin1, E. Vasseur2, D. Pellerin3, D. B. Haly4, A. M. de Passillé1, J. Rushen1, and R. L. A. Cerri1, 1University of British Columbia, Vancouver, BC, Canada, 2McGill University, Sainte-Anne-de-Bellevue, QC, Canada, 3Université Laval, Quebec City, QC, Canada, 4University of Guelph, Guelph, ON, Canada.

We aimed to determine herd-level factors of cow comfort associated with reproductive outcomes on dairy farms. Animal (BCS, lameness, skin lesion and cleanliness) and environmental assessments were carried out on 130 freestall and 97 tiestall farms in Canada (AB, QC and ON) at a single visit to each farm. Herd reproductive variables were calculated from DHI records: calving interval (CI), number of inseminations per cow year (NI), and conception rate (CR); days to first service was also calculated as a covariate. All categorized variables were classified by the median of each farm type. Mean (±SD) CI, NI, and CR was 417 ± 22d, 2.16 ± 0.34 inseminations (AI), and 34.1 ± 6.7% for freestall farms, and 427 ± 21d, 2.30 ± 0.37 AI, and 29.9 ± 6.4% for tiestall farms. On freestall farms, knee lesion prevalence had negative relationships with all reproductive outcomes: farms with fewer knee lesions tended to have shorter CI (415 ± 2.5 vs. 422 ± 2.5d; P = 0.07), and had lower NI (2.04 ± 0.04 vs. 2.16 ± 0.04; P = 0.03) and higher CR (36.0 ± 0.9 vs. 33.2 ± 1.1%; P = 0.04). Proportion of older cows (parity ≥ 3) was related to NI, where younger herds had lower NI (2.04 ± 0.04 vs. 2.16 ± 0.04 AI; P = 0.03). Milk production per cow per year was related to CI and CR: farms producing more milk had better reproductive outcomes. On tiestall farms, CI was related to the proportion of older cows and power in electric trainers, younger herds (420 ± 2.5 vs. 431 ± 2.7d; P < 0.01) and those that did not power electric trainers (420 ± 2.7 vs. 430 ± 2.8d; P = 0.01) had shorter CI; CI was also shorter in herds producing more milk (P = 0.01). Knee lesions and insufficient stall length tended to be related to NI, where farms with more stalls had insufficient length for their cows (2.43 ± 0.06 vs. 2.31 ± 0.06 AI; P = 0.09) and more knee lesions (2.44 ± 0.06 vs. 2.30 ± 0.06 AI; P = 0.07) required more NI. Lameness prevalence was only related to CR on tiestall farms; farms with less lameness had higher CR (P = 0.01). Herd-level BCS and cleanliness were not associated with reproductive outcome on either farm type. In conclusion, farms with poorer reproductive outcomes were...
Characterized by a higher prevalence of knee lesions, higher proportion of older cows and produced less milk.

**Key Words:** fertility, injury, reproductive outcomes

**T187** Relationship between cow cleanliness, locomotion, and bulk tank somatic cell count in southeastern United States dairy farms. G. Mazon*,1, J. Guinn1, D. Nolan1, P. Krawczel2, C. Peterson-Wolfe3, G. Pighetti2, A. Stone1,4, S. Ward5,4, M. Marcondes6, and J. Bewley1. 1University of Kentucky, Lexington, KY, 2University of Tennessee, Knoxville, TN, 3Virginia Polytechnic Institute, Blacksburg, VA, 4Mississippi State University, Starkville, MI, 5North Carolina State University, Raleigh, NC, 6Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil.

The objective of this study was to evaluate udder hygiene score (UHS), locomotion score (LS), and their relationships to bulk tank somatic cell count (BTSSC) group and bulk tank somatic cell score (BTSCS). Data from 4,837 cows were obtained from 94 Kentucky dairy herds participating in the Southeast Quality Milk Initiative project (USDA-NIFA-AFRI grant no. 2013–68004–20424). Each herd was visited once between June 2014, and June 2015. Herds were divided into 3 BTSSC groups: low = mean BTSSC ≤210,000 cells/mL (n = 28), medium = 210,000 < BTSSC <380,000 cells/mL (n = 50), and high = BTSCS ≥380,000 cells/mL (n = 10). Herd size ranged from 35 to 2,500 lactating cows. Animals from each herd were scored for LS and UHS once. A 3-point scale was used for LS where 1 = sound cow, 2 = moderately lame cow, and 3 = severely lame cow. Udder hygiene was scored using a 4-point scale where 0 = less than 50% of the udder covered with fresh splashes of manure, and 3 = entire udder covered with dry manure. Yearly mean BTSCS was calculated from monthly milk processor BTSCC data where BTSC = log2 (BTSCC/100,000) + 3. The FREQ procedure of SAS (Version 9.3 SAS Institute, Inc., Cary, NC) and a Chi-squared analysis were used to examine the relationship between BTSSC group and UHS or LS. The MIXED procedure of SAS was used to determine the relationship of LS, UHS, and their interaction to BTSCS. In the Chi-squared analysis, a greater percentage of the lactating herd with a UHS = 0 occurred in low BTSSC herds (68%) compared with medium (60%) and high (58%) BTSSC herds (P < 0.01). A greater percentage of the lactating herd with a LS = 1 occurred in low BTSSC (77%) compared with medium (69%) and high (67%) BTSSC herds (P < 0.01). In the mixed model, no significant interaction between UHS and LS was found (P = 0.28). As LS decreased BTSCS decreased (P < 0.02), whereas UHS had no significant interaction between UHS and LS was found (P = 0.28). P < 0.01). In the mixed model, no significant interaction between UHS and LS was found (P = 0.28). As LS decreased BTSCS decreased (P < 0.02), whereas UHS had no significant interaction between UHS and LS was found (P = 0.28). The results of this study suggested lower lameness and cleaner udders were associated with lower BTSCS and BTSCS.

**Key Words:** bulk tank somatic cell count, lameness, hygiene

**T188** Evaluation of four on-farm culture plates to identify pathogens associated with mastitis in dairy cows. J. C. Ferreira*,1, M. S. Gomes, E. C. R. Bonsaglia, I. C. Canisso, E. F. Garrett, and F. S. Lima, University of Illinois, Champaign-Urbana, IL.

A precise cow-side point care system for the diagnosis of mastitis is critical for targeted antimicrobial therapy. Recently, several multiple-media culture systems became commercially available for on-farm identification of mastitis pathogens. However, the accuracy of these systems has not been thoroughly and independently validated against microbiological evaluations performed by referral laboratories. Therefore, the purpose of the present study was to evaluate the effectiveness of popular commercially available culture plates (Accumast, Minnesota Easy System, SSGN and SSGNC Quad plates) to identify pathogens associated with clinical mastitis in dairy cows. Milk samples from the affected quarter with clinical mastitis were collected aseptically. Samples were aerobically cultured with the on-farm culture systems and by 2 reference laboratories. Agreeing results from both reference laboratories were denoted as gold standard (GS). Accuracy (Ac), sensitivity (Se), specificity (Sp), positive and negative predictive values (PPV and NPV, respectively), and Cohen’s kappa coefficient (k) of on-farm plates were determined based on the GS culture of 211 milk samples. All 4 plates correctly identified ≥84.9% of milk samples with no bacterial growth. Accumast had greater values for all predictive factors and a substantial agreement (k = 0.79) with GS (Table 1). The inter-rater agreements of Minnesota, SSGN, and SSGNC with GS were moderate (0.45 ≤k ≤0.55). Only Accumast correctly identified Staphylococcus aureus (Ac = 66.7% and Se = 100%). Likewise, Accumast had greater Ac for Streptococcus sp. (55%) than the remaining plate systems (33.3% ≤AC ≤38.9%). Our findings suggest that Accumast was the most accurate on-farm culture system for identification of mastitis pathogens.

**Table 1** (abstract T188). Predictive factors for identifying mastitis-related pathogens using four culture plates (n = 211)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Accumast</th>
<th>Minnesota</th>
<th>SSGN</th>
<th>SSGNC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ac, %</td>
<td>89.6</td>
<td>73.5</td>
<td>79.1</td>
<td>75.8</td>
</tr>
<tr>
<td>Se, %</td>
<td>97.6</td>
<td>88.9</td>
<td>79.4</td>
<td>79.4</td>
</tr>
<tr>
<td>Sp, %</td>
<td>84.5</td>
<td>68.2</td>
<td>79.0</td>
<td>74.3</td>
</tr>
<tr>
<td>PPV, %</td>
<td>80.0</td>
<td>49.0</td>
<td>64.3</td>
<td>56.8</td>
</tr>
<tr>
<td>NPV, %</td>
<td>98.2</td>
<td>94.7</td>
<td>89.0</td>
<td>89.4</td>
</tr>
<tr>
<td>κ</td>
<td>0.79</td>
<td>0.45</td>
<td>0.55</td>
<td>0.48</td>
</tr>
</tbody>
</table>

**Key Words:** on-farm culture, mastitis-associated pathogens, antibiotics
versus in cool period (P ≤ 0.001). Within multiparous cows, the odds ratio of starting a lactation with an abortion were 1.52 times higher in warmer period versus in cool period (P ≤ 0.001). For primiparous and multiparous cows 305dMY and PMY were significantly higher in cows that had gestation at term than cows that had an abortion (Differences in 305dMY: primiparous: 869 L; P ≤ 0.001, multiparous: 2,062 L; P ≤ 0.001; Differences in PMY: primiparous: 4 L/d; P ≤ 0.001, multiparous: 8 L/d; P ≤ 0.001). The effect of parity period and the interaction with type of lactation depends on animal category. For primiparous cows, the 305dMY and PMY were less in warmer period in both type of lactation. Whereas for multiparous cows, 305dMY and PMY were less in warmer period in cows who had calved in term, but were greater in cows that had experienced an abortion.

Key Words: no lineal models, milk test, cumulative milk yield

T190 Relationship between body condition score and serum plasma insulin-to-glucose ratio on embryo production in lactating dairy cows. T. Leiva*1, R. F. Cooke2, R. D. Bertin1, A. C. Fonseca1, R. Norell*1, J. Spencer2, A. Ahmadzadeh2, M. E. de Haro Marti3, and M. Chahine4, 1University of Idaho, Gooding, ID, 2University of Idaho, Moscow, ID, 3University of Idaho, Twin Falls, ID.

By Idaho statute, a 500-ohm shunt resistor must be used when investigating stray voltage on dairies and represents a “worst case” body resistance (BODYR) value for adult dairy cows (USDA stray voltage handbook 696, 1992). BODYR data from the 80s were typically collected from cows in tie stall barns and may not represent modern open lot and free-stall dairies. Our study objectives were to compare: (a) BODYR of 6 cow pathways, (b) effect of wet versus dry haircoats, and (c) 3 electrical connections to the mouth area. BODYR data were collected from 42 cows on a commercial open lot dairy in Idaho. Pathways were: front to rear hooves (FR), neck to all hooves (NALL), rump to all hooves (RALL), mouth to all hooves (MALL), mouth to front hooves (MF), and mouth to rear hooves (MR). NALL and RALL were tested with wet and dry haircoats and data were analyzed as a 2 × 2 factorial model in SAS. MALL, MF, and MR were evaluated with 3 mouth area connections (nose tongs (NT), metal bit (MT), and metal basket (MB)) and data were analyzed as a 3 × 3 factorial model in SAS. BODYR varied significantly between pathways and ranking median BODYR (ohms) from lowest to highest value yields: MALL (255), RALL-wet (314), MF (360), MR (361), FR (469), NALL-wet (544), RALL-dry (9,185) and NALL-dry (820,000). BODYR was significantly lower for rump versus neck location, for wet versus dry haircoats, and exhibited a significant location by heartbeat status interaction due to significantly lower BODYR with dry rump versus dry neck. Cows were measured immediately after milking and the rump or udder may have received water spray or contacted wet pipework during milking. BODYR with the mouth connections and pathways were significantly lower for MALL than MF or MR, for NT versus MT and MB; and exhibited a significant interaction between mouth connections and hoof pathways. The percentage of measurements below 500 ohms varies by pathway: MALL (98%), MF (98%), MR (96%), RALL-wet (82%), FR (69%), NALL-wet (34%), RALL-dry (5%) and NALL-dry (0%). A 500-ohm shunt resistor overestimates BODYR and underestimates electrical current flow at a given voltage for MALL, MF, MR, RALL-wet, and FR pathway. Contact method and heartbeat condition influence measured BODYR of cows.

Key Words: resistance, stray voltage

T192 Survey of work processes on German dairy farms. A. Hesse*1,2, S. Bertulat1, and W. Heuwieser1,2, 1Clinic for Animal Reproduction, College of Veterinary Medicine, Universitaet Berlin, Berlin, Germany, 2Department of Population Medicine and Diagnostic Sciences, Cornell University, College of Veterinary Medicine, Ithaca, NY.

Current information about continuing education, prevalence and utilization of standard operating procedures (SOP), and challenges related to training of the work force implemented on commercial dairy farms is rare. Transparency and consistency of production processes, however, are important to assure trust by the consumers and satisfy their expectations. Therefore, the objective of this study was to conduct a survey to gain insight into the organization of work processes on commercial German dairy farms analyzing the use of SOPs. A questionnaire was developed that consisted of 16 questions and 9 statements focusing on general farm data, the generation, implementation and handling of SOP as well as an assessment of challenges in handling work processes on the farm. The questionnaire was distributed using 3 convenience samples (i.e., 2 workshops, 1 mailing). A total of 250 survey forms were returned and 248 could be used for final analysis. The existence of SOP was indicated by 82% of all respondents, but only 54% stated
that these were written down. On only 30% of the participating dairy farms SOP were available for trainees. Existence of SOP correlated with farm size such that larger farms were more likely to implement SOP than smaller farms ($P = 0.007$). However, many farmers lacked the time (41%) or ability (42%) to create SOP to provide the employees with detailed instructions on how to perform a specific task. Sixty-six per cent of the participants agreed or strongly agreed with the statements that various employees handled the same tasks differently. Eighty-one per cent of the managers indicated that they “sometimes get annoyed about employees not completing tasks the way they consider right.” However, 86% of respondents considered a consistent work performance as a benefit; another 49% (87/179) and 39% (70/179), respectively, regarded monitoring of work processes and improvement of animal health as beneficial. The majority of respondents (59%) were interested in using ready-made SOP that could be adjusted to their farm. On 68% of the farms continuing education for employees was neglected. There was an obvious discrepancy between the motivation of the farmers to improve the performance on their farm and the expertise in realizing these goals and intentions.

**Key Words:** survey, standard operating procedure, training