Research Projects Funded by

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2010

NEIBERGS, Holly L., Washington State University, Pullman, Washington
Identification of gene mutations responsible for susceptibility to tissue infection of *Mycobacterium avium* subspecies *paratuberculosis* in Jersey cattle.

PEARSON, Ron, Virginia Polytechnic Institute and State University, Blacksburg, Virginia
JPI formula.

PRIEN, Sam, Texas Tech University, Lubbock, Texas
Use Of a mouse model to demonstrate improved embryo survival rates following cryopreservation: A potential means of improving Jersey embryo survival.

VILLARROEL, Aurora, Oregon State University, Corvallis, Oregon
Evaluation of failure of passive transfer in replacement Jersey calves.

WEIGEL, Kent, University of Wisconsin, Madison, Wisconsin
Development of a genome-guided mating program for Jersey cattle.

2010 Research Project Summaries

Neibergs, Holly L., Washington State University, Pullman, WA, Identification of Gene Mutations Responsible for Susceptibility to Tissue Infection of *Mycobacterium avium* subspecies *paratuberculosis* in Jersey Cattle.

Objective: To identify if mutations in *HIVEP3* or *EDN2* genes were associated with susceptibility to *Mycobacterium avium subsp. paratuberculosis (Map)* tissue infection in Jersey cattle thus gaining critical information to select for animals that are less susceptible to Johne's disease.

Our **Hypothesis** was that mutations in *EDN2* or *HIVEP3* genes were responsible for the association of bovine chromosome 3 with susceptibility to tissue infection of *Map* (the bacteria that leads to Johne's disease).

Outcomes: Dr. Curt Van Tassel at the USDA, ARS in Beltsville, MD completed the comparison of the DNA sequence of several Jersey cattle and several Holstein animals in the region on bovine chromosome three where *EDN2* and *HIVEP3* are located and found over 1400 DNA variants. The DNA sequence was then evaluated to determine which regions were most likely to be important to the function of an animal if they were altered. This was done by aligning the DNA sequence with DNA sequences of other animals (humans, horse, sheep, etc.). The objective of this is to identify conserved DNA regions as DNA sequence that is conserved across species is usually indicative that the DNA is important for the well-being of the animal. Regions of genes that code for proteins (exons and exon/intron boundaries), DNA regulatory regions (regions that control whether or how much a gene is expressed), as well as conserved DNA regions were scrutinized to identify if any of the 1400 DNA variants were located within them. Ninety-six DNA variants that were located within these important regions were chosen for further evaluation.

Tissues from 60 Jersey cattle were collected at harvest and determined if they were infected with *Mycobacterium avium* subsp. *paratuberculosis*. Diagnostic testing identified 16 animals that were tissue infected. Genotyping of infected and uninfected cattle was undertaken with the 96 DNA variants identified in the region of *EDN2* and *HIVEP3* to determine if one of these variants was responsible for the susceptibility of Jersey cattle to *Mycobacterium avium* subsp. *paratuberculosis* tissue infection. This analysis identified two DNA variants in highly conserved regions that were strongly associated with tissue infection: one DNA variant within the *EDN2* gene that was also a regulatory region for three other genes ($P = 0.0068$) and another DNA variant 2,000 nucleotides before the *EDN2* gene ($P = 0.007$) that was a regulatory element for a protein (thyroid transcription factor 1) that regulates many other genes. In addition, eleven more DNA variants were found to be associated ($P= 0.012$ to 0.025) with tissue infection that were located from 20,000-3,000 nucleotides before the *EDN2* gene. The DNA variant within the *EDN2* gene was also the most significant variant in over 250 Holstein cattle that were genotyped.

We are continuing to study these variants to determine if and how these alterations in the DNA affect the ability of the animal to make functional proteins that aid in the fight against *Mycobacterium avium* subsp. *paratuberculosis* tissue infection and to identify how frequent these variants are in the Jersey population.

In summary, our **objective** was to identify if mutations in *HIVEP3* or *EDN2* genes were associated with susceptibility to *Mycobacterium avium subsp. paratuberculosis.* We **hypothesized** (and were correct) that one of these mutations would lie within the *EDN2* or *HIVEP3* gene. Our **results** identified 13 mutations that were associated with susceptibility to tissue infection. The *EDN2* DNA variant is being further investigating to determine the physiological effect this mutation has on cattle and how prevalent this mutation is within the Jersey breed. The **significance** of these results is that we are much closer to being

able to identify the cause of susceptibility of cattle to Johne's disease and to be able to select for animals that are less likely to become tissue infected. The ability to select for animals that are less susceptible to Johne's disease will ultimately reduce morbidity and improve animal welfare, production and profitability.

Prien, Sam, Texas Tech University, Lubbock, TX, Use of a Mouse Model to Demonstrate Improved Embryo Survival Rates Following Cryopreservation: A potential means of improving Jersey embryo survival

Objective: Cryopreservation is currently the only method for long-term embryo storage. However, it is well documented that embryos from certain species and individuals do not store well. Previous work from this lab with cattle embryos suggested differences seen between breeds were due to embryo lipid content which appeared to be influenced by material body condition ($p<0.001$). Similar results were obtained for embryo weights between mice with genetically derived differences in body conditions; a mouse homozygous for a genetic defect that causes obesity ("pound mouse"), and a heterozygous and lean mouse of the same strain. With food intake held constant, the weight gain (and fat storage) of the pound mouse is directly related to animal age. The objective of the present study was to determine the influence of maternal body condition on embryo chemistry within this single genetic line.

Design: Laboratory based study of embryo chemistry.

Materials and Methods: Embryos from a single genetic line (C57BL/6NCrL-Lepr$^{db\text{-}lb}$/CrL – pound mice) were harvested according to standard protocols as the dame reached body weights of 30, 40, and 50g. Embryos were collected from a total of 5 mice at each weight. Once harvested the embryos were cultured for five days then weights determined using a previously described modified specific gravity technique. Resulting data were compared using ANOVA and linear regression.

Results: As designed, the dames exhibited substantially different weights associated with their age (6 wks – 30 g, 7 wks –40 g and 8 wks –50 g; $p<0.001$). While there was only a trend for embryo weight to decrease as maternal weight increased ($p=0.063$) in these high weigh animals, the relationship was linear ($p < 0.018$).

Conclusions: The data continues to suggest maternal weight and body composition may influence embryo chemistry, particularly lipid content. Use of the pound mouse model should allow full exploration of this relationship.

Villarroel, Aurora, Oregon State University, Corvallis, OR, **Evaluation of failure of passive transfer in replacement Jersey calves.**

Hypotheses: Jersey calves have higher levels of total protein (TP) and immunoglobulins (IgG) in serum during their first days of life than Holstein calves using similar colostrum protocols. Therefore, the cut-off value to determine failure of passive transfer (FPT) may be higher in Jersey calves than the one used based on data from Holstein calves.

Results: A total of 313 Jersey and 30 Holstein calves, 1 to 14 days of age were enrolled in the study. Both TP and IgG concentrations in Jersey calves were consistently (0.4±0.1 g/dl of TP, and 546.3±140.7 mg/ml of IgG) and significantly ($P<0.001$) higher than Holstein calves of the same age.

Of the enrolled Jersey calves, 169 (52.3%) were diagnosed with pre-weaning scours at an average of 7.1±1.9 days, and 133 (41.2%) with pneumonia, at an average of 36.1±9.9 days. Six calves (1.9%) died

during the study period (18.3±9.7 days). Based on our data, there was no statistical difference found in serum TP, IgG, or GGT levels in calves with scours or pneumonia, or calves that died, in comparison with healthy calves.

Conclusions: Cutoff values established for TP (>5.0mg/dL) and IgG (>10.0 mg/dL) in Holstein calves do not apply to Jersey calves. According to our data, there is no relationship between these parameters historically used as markers for passive transfer and morbidity and mortality in Jersey calves. The most likely explanation for this is that a one point intervention such as colostrum management is not the sole risk factor for morbidity and mortality, but that daily management throughout the calves' life largely influence the outcome.

Notes: Preliminary results of this research were presented at the World Buiatrics Conference in Santiago, Chile on November 14-18, 2010. Additionally, three abstracts were submitted by each of the three veterinary students supported by this grant to the Annual Conference of the American Association of Bovine Practitioners (AABP) to be held in St. Louis, MO on September 22-24, 2011. Two of the three abstracts were accepted for the student competition, which only accepts five research presentations from students of all 35 U.S., Canadian and Caribbean veterinary schools each year.

2011

CHEBEL, Ricardo C., University of Minnesota, St. Paul, Minnesota

Characterization of follicle growth, corpus luteum development and steroidal hormones plasma concentration during the estrous cycle of lactating Jersey cows.

DANIELS, Kristy, The Ohio State University, Ohio Agricultural Research and Development Center, Wooster, Ohio

Effects of Dietary coconut oil inclusion on liver fatty acid metabolism at the gene level in Jersey calves.

LAGER, Kevin and Ellen Jordan, Texas AgriLife Extension Services, Canyon, Texas

Assessment of the metabolic profile for transition Jersey dairy cattle.

TYLER, Howard and Kimberly Morrill, Iowa State University, Ames, Iowa

A rapid, on-farm method to determine quality of colostrum from Jersey cattle.

2011 Research Project Summaries:

Chebel, Richardo C., University of Minnesota, St. Paul Minnesota, Characterization of follicle growth, corpus luteum development and steroidal hormones plasma concentration during the estrous cycle of lactating Jersey cows.

Moraes, J.G.N., P.R.B. Silva, N. Bortoletto, A.L.A. Scanavez, R.C. Chebel. 2011. Plasma progesterone concentration and follicle dynamics of lactating Jersey cows treated with 1 or 2 intra-vaginal progesterone insert. J. Dairy Sci. 92 (Suppl. 1).

Objectives: Determine the progesterone (P4) concentration and the follicle dynamics of lactating Jersey cows treated with 1 or 2 intra-vaginal P4 insert.

Cows and presynchronization: Cows were enrolled in the study at 34 ± 3 DIM and were paired by parity, BCS (3.1 ± 0.1), body weight (421.7 ± 5.2 kg), and milk yield (28.8 ± 0.6 kg/d). All cows were presynchronized with an injection of GnRH concurrent with controlled internal drug release (CIDR) insert containing 1.38 g of P4 and 5 and 6 d later all cows received a $PGF_{2\alpha}$ injection. The day of the first PGF2α injection was determined d -2 of the study.

Treatments: Cows assigned to the 1CIDR treatment (n = 25) received a CIDR insert from d 0 to 8, cows assigned to the 2CIDR treatment (n = 27) received 2 CIDR inserts from d 0 to 8, and control cows (n = 10) did not receive further treatment.

Material and Methods: Cows were examined by ultrasound and ovarian structures were measured and mapped on d -2 and daily from d 0 to 8. Blood samples were collected for determination of P4 on d -2 and daily from d 0 to 8 and blood samples were collected for determination of estradiol concentration from d 0 to 8.

Results: Average P4 concentration from d 0 to 8 was ($P < 0.01$) smallest for control cows (0.73 ± 0.17 ng/ml) followed by 1CIDR (1.37 ± 0.10 ng/ml) and 2CIDR (2.21 ± 0.09 ng/ml) cows, respectively. Diameter of the largest follicle on d 0 (16.2 ± 0.6 mm) was not different ($P = 0.14$) among treatments, but percentage of cows that developed codominant follicles was smallest for 1CIDR cows (1CIDR = 8.0, 2CIDR = 30.8, control = 50%; $P = 0.02$). Percentage of cows ovulating the dominant follicle identified on d 0 was greatest for control cows (1CIDR = 0, 2CIDR = 3.9, control = 80%; $P < 0.01$) and the interval to ovulation was 96 h from d -2 for the 2CIDR cow and averaged 123.0 ± 12.4 h from d -2 for control cows. Control cows were more likely to develop a new dominant follicle from study d 0 to 8 (1CIDR = 12, 2CIDR = 7.7, control = 60%; $P < 0.01$), but there was no ($P = 0.65$) difference in interval to identificantion of the new dominant follicle (106.9 ± 9.9 h from d -2).

Conclusions: Treatment with CIDR insert results in increase in P4 and pattern of follicular growth similar to those described for Holstein cows.

Silva, P.R.B., J.G.N. Moraes, L.G.D. Mendonça, G. Nakagawa, R.C. Chebel. 2012. Peripartum metabolic, immune, and hematological parameters of Jersey cows diagnosed with periparturient diseases. J. Dairy Sci. 93 (Suppl. 1).

Objectives: Evaluate the metabolic, immune, and hematological parameters of Jersey cows diagnosed with postpartum diseases.

Material and Methods: Blood was sampled weekly from d -21 to 21 (calving = d 0) for NEFA concentration (n = 567) and weekly from d -14 to 14 from a subgroup of cows (n = 68) for neutrophil

phagocytosis (PHAGO), oxidative burst (OXID), and expression of CD18 and L-selectin, hemogram, and glucose concentration. Cows were examined on d 1, 4, 7, 10, and 14 for diagnosis of retained fetal membranes (RFM) and metritis (METR) and examined thrice daily for diagnosis mastitis and once daily for diagnosis of displacement of abomasum (DA).

Results: Interaction of RFM by day and METR by day were ($P < 0.05$) associated with OXID and PHAGO because RFM cows and METR cows had reduced OXID and PHAGO on d 0 than normal cows. Interaction of RFM by day tended ($P = 0.08$) to be associated with CD18 expression intensity as RFM cows had higher intensity on d 14 than normal cows. Greater percentage of neutrophils from RFM ($P = 0.03$) and METR ($P < 0.01$) cows expressed L-selectin than normal cows. Interaction of RFM by day and METR by day were ($P < 0.04$) associated with leukocyte count because leukocyte count was highest on d0 in normal cows but leukocyte count was highest from d-14 to 0 in RFM and METR cows. Interaction of METR by day tended ($P = 0.08$) to be associated with neutrophil count because only normal cows had increase neutrophil on d0. Interaction of RFM by day was ($P < 0.01$) associated with glucose because on d -7 and 7 RFM cows had greater glucose than normal cows. Interaction METR by day was associated with glucose ($P = 0.02$) and NEFA ($P < 0.01$) concentration because METR cows had greater glucose pre and postpartum and greater NEFA on d -14, 0, and 7 than normal cows. Interaction of DA and day was ($P = 0.03$) associated with NEFA because DA cows had greater NEFA on d -7, 0, 7, and 21 than normal cows. NEFA > 0.18 mmol/l on d-7 predicted DA with 66.7% sensitivity and 76.4% specificity and NEFA > 0.43 mmol/l on d 0 predicted metritis with 46.2% sensitivity and 74.1% specificity.

Conclusions: Immune, metabolic, and hematological alterations peripartum were associated with postpartum diseases. Interestingly, the concentrations of NEFA observed in transition Jersey cows was significantly reduced compared with the NEFA concentrations reported in the literature for Holstein cows. Similarly, the threshold concentrations of NEFA associated with DA and metritis were also reduced compared with the thresholds observed in Holstein.

Chebel, R.C., L.G.D. Mendonça, P.R.B. Silva, J.G.N. Moraes. 2012. Immunological and metabolic responses of Holstein and Jersey cows according to body condition score change prepartum. J. Dairy Sci. 93 (Suppl. 1).

Objectives: evaluate the immune and metabolic responses of Holstein (H) and Jersey (J) cows according to body condition score change (BCSC) prepartum.

Material and methods: Data from 2 experiments were used. Experiment 1 was conducted with Holstein cows (n = 29) and experiment 2 was conducted with Jersey cows (n = 68). Cows received BCS on d -22 ± 7 and 1 ± 1 (calving = d 0) and were classified as having lost (L) and as having not lost (NC) BCS prepartum. Blood was sampled on d -7, 0, 7, and 14 for determination of neutrophil phagocytosis (PHAGO) and oxidative burst (OXID) and expression of CD18 and L-selectin and concentrations of NEFA and glucose.

Results: Percentages of H (65.5%) and J (51.5%) cows losing BCS prepartum were similar ($P = 0.20$). The interaction between breed and BCSC was associated with most of the innate immunity parameters evaluated because among J cows BCSC was not associated with innate immunity parameters ($P > 0.10$). On the other hand, HL cows had reduced PHAGO (57.8 ± 3.6 vs 73.9 ± 4.8%; $P < 0.01$) and OXID (93.2 ± 0.7 vs 96.0 ± 0.9%; $P = 0.02$) than HNC cows. The interaction between breed and BCSC tended ($P = 0.09$) to be associated with intensity of OXID because HL cows had reduced OXID intensity than HNC cows (15857 ± 3052 vs 24770 ± 3782; $P = 0.07$). There was a tendency for the interaction between breed and BCSC to be associated with percentage of neutrophils positive for CD18 ($P = 0.08$) because HL cows tended to have reduced percentage of neutrophils expressing CD18 than HNC cows (L = 74.1 ± 2.0 vs NC = 80.2 ± 2.5%; $P = 0.06$). Concentration of NEFA was associated with BCSC (L = 0.533 ± 0.038, NC = 0.429

± 0.044 mmol/L; *P* = 0.03) but was not associated with the interaction between breed and BCSC (*P* = 0.99). On the other hand, glucose concentration was not associated with BCSC (*P* = 0.50) or with the interaction between breed and BCSC (*P* = 0.62).

Conclusions: Even though the metabolic consequences of BCS loss during the close-up period seem to be similar between Holstein and Jersey cows, loss of BCS during the close-up period was more deleterious to Holstein cows than Jersey cows. Larger studies may be necessary to determine the degree of BCS change during the close-up period that would affect immune status of Jersey cows.

Daniels, Kristy, and V.A. Swank, The Ohio State University, Ohio Agricultural Research and Development Center, Wooster, Ohio, Effects of dietary coconut oil inclusion on liver fatty acid metabolism at the gene level in Jersey calves.

Objective: To determine whether altering the FA profile of CMR with the inclusion of coconut oil (CO), a rich source of MCFA, would alter liver gene expression in Jersey calves.

Calves were randomly assigned at birth to 1 of 4 liquid diets: pasteurized Jersey pSWM (27.9% CP, 33.5% fat, DM basis); CMR containing 100% of fat as edible lard (100:00; 29.3% CP, 29.1% fat); CMR containing 20% of fat as CO (80:20; 28.2% CP, 28.0% fat); CMR containing 40% of fat as CO (60:40; 28.2% CP, 28.3% fat). Calves were fed their respective liquid diet twice daily (0600h and 1800h) from 2d of age until 7wk of age, and once daily until weaning (8wk of age).

To assess whether or not liquid diets contributed to changes in gene expression, liver biopsies were obtained from 15 calves (4 calves on SWM, 100:0, and 60:40; 3 calves on 80:20) when they were approximately 42 d of age. Because calves began the weaning process at 49 d of age, this time point represented a time when calves were all still receiving pSWM or CMR. Baseline liver biopsies were also obtained from 4 bull calves on day 2 of life and processed identically to those obtained at 42 d of age; baseline calves were not enrolled in the study nor were they biopsied at 42 d of age. Transcutaneous biopsy samples were obtained (~100 mg/sample, 5 samples) with an EZ Core Biopsy instrument (Products Group International; 16G 1.6 mm x 9 cm trocar or 14G 2.1 mm x 9 cm trocar), using a protocol approved by Ohio State's Animal Care and Use Committee.

Biopsy cores were snap frozen in liquid nitrogen and stored at -80°C for later gene expression analysis. Four genes associated with oxidation of lipids in the liver were included. These consisted of three acyl-coenzyme A dehydrogenases (**CAD**), each with a specificity for fatty acids of a certain chain length. Genes were short chain (**SCAD),** medium chain (**MCAD**), and long chain (**LCAD**). Another gene of interest was sterol regulatory element-binding protein-1c (**SREBF-1c**). It is regulated by nutrition and contributes to the lipogenesis in liver tissue (McFadden and Corl, 2009). Ribosomal protein s9 (**RSP9**) served as a housekeeping gene. Data were normalized to expression of RSP9 and analyzed statistically.

Our experimental plan allowed us to examine effects of dietary CO inclusion on liver gene expression in Jersey calves. Expression of selected genes related to fatty acid metabolism was not different among treatments (**Table 1**). Additionally, given that calves grew the same on the 4 diets (data not shown); our findings were perhaps to be expected. Findings lead us to believe that increased inclusion amounts of MCFA in CMR diets for Jersey calves may not be of large biological importance, as we originally thought.

Table 1. Relative abundance ($2^{-\Delta Ct}$; larger number equates to more mRNA) of mRNA for SCAD, MCAD, LCAD, and SREBF-1 in liver biopsies from 42 d old Jersey calves on 1 of 4 diets, and in liver biopsies from 2 d old baseline Jersey calves

	Diets[1]						
Genes[2]	pSWM	100:00	80:20	60:40	Baseline[3]	SEM[4]	*P*-value
SCAD	0.07	0.08	0.10	0.15	0.03	0.045	0.377
MCAD	0.11	0.16	0.15	0.11	0.07	0.045	0.568
LCAD	0.02	0.02	0.02	0.03	0.01	0.012	0.653
SREBF-1	0.008	0.003	0.003	0.005	0.014	0.003	0.131

1 pSWM (27.9% CP, 33.5% fat, DM basis); CMR containing 100% of fat as edible lard (100:00; 29.3% CP, 29.1% fat); CMR containing 20% of fat as CO (80:20; 28.2% CP, 28.0% fat); CMR containing 40% of fat as CO (60:40; 28.2% CP, 28.3% fat).

2 SCAD=acyl-Coenzyme A dehydrogenase, short chain; MCAD=acyl-Coenzyme A dehydrogenase, medium chain; LCAD=acyl-Coenzyme A dehydrogenase, long chain; SREBPF-1=regulatory element binding transcription factor 1; FAS=fatty acid synthase; ACC=acetyl-CoA carboxylase

3 Baseline calves were biopsied on d 2 of life; baseline calves were not placed on trial.

4 SEM = standard error of the mean; highest listed.

Lager, Kevin and Ellen Jordan, Texas AgriLife Extension Services, Canyon, Texas, Assessment of the metabolic profile for transition Jersey dairy cattle.

Eight cooperator commercial Jersey dairy herds ranging in size from 500 to 6000 head in the Southern High Plains were identified and over 1850 blood samples were collected in June 2011 from animals within the transition period. Analysis of serum was completed for calcium, phosphorus, magnesium, sodium, chloride, potassium, blood urea nitrogen, glucose, non-esterified fatty acids (NEFA), beta-hydroxybutyrate, and cholesterol between October and November 2011. Dairy herd records were collected to identify cows experiencing illness, lameness, and issues with calving.

Currently data is being analyzed to determine the effects of illness, lameness, or issues with calving or a combination of the previously mentioned factors on the metabolic profile. Also, utilizing data previously collected from Holstein herds, an analysis for the impact of breed on the metabolic profile is also being conducted along with potential effects on post-partum reproductive performance. One example of the types of findings is the difference in average NEFA levels between Jersey and Holstein breeds. Jersey animals, both those classified as healthy and as experiencing disease, have lower NEFA levels than Holsteins classified as healthy or those experiencing disease. Results on the effect of breed will be presented at the 2012 Joint Annual ADSA Meeting held in Phoenix, AZ.

Tyler, Howard and Kimberly Morrill, Iowa State University, Ames, Iowa, Evaluation of failure of passive transfer in replacement Jersey calves.

Kim Morrill completed her dissertation work on a nationwide survey of colostrum quality through fall, 2011. Our initial proposal was focused on using caprylic acid to precipitate non-Ig proteins and improve the accuracy of measurements of colostral IgG on-farm using a refractometer. Our initial data supported the use of this procedure when compared to previous data from Ken Leslie's group in Guelph. However, the data from the nationwide survey later revealed that the difference between our data and their data was not the use of caprylic acid, but was affected greatly by whether the colostrum was frozen prior to analysis. For our data, a total of 797 colostrum samples were collected from 67 dairies across the country. Samples had previously been broken down based on storage method (fresh, refrigerated or frozen); this study further divided these groups based on the number of freeze thaw cycles prior to analysis by refractometry and radial immunodiffusion (RID). Samples that were analyzed by refractometry fresh and went through 1 freeze thaw cycle prior to RID analysis resulted in a strong relationship between RID obtained IgG concentration and refractometry ($r = 0.90$). The MC samples that were collected fresh, but went through 2 or more FT cycles prior to analysis by refractometry and RID resulted in a weak relationship between RID obtained IgG concentration and nD ($r = 0.01$). Samples that were refrigerated or frozen prior to collection had weaker relationships between nD and RID ($r = 0.38 – 0.80$) regardless of the number of freeze thaw cycles. Clearly, refractometry of whole colostrum CAN provide a very accurate estimate of IgG concentration in colostrum.

The major concern raised by the data, however, was the lack of accuracy after freezing. We were not able to determine whether the loss of accuracy was due to freezing and thawing affecting the refractometer's ability to measure IgG, the RID kits becoming inaccurate, or both. This is a crucial question for several reasons:

1) If refractometers ARE accurate on both fresh and previously frozen colostrum, that would provide a great tool for producers that is both accurate and robust. However, if they are only accurate on fresh colostrum, that is an important message to convey to producers that choose to use this tool and limits their usefulness.

2) If the RID kits lose their ability to accurately measure IgG in colostrum samples that have been frozen and thawed, this has a major implication for much of the previous (and potentially future) research done in this field. Radial immunodiffusion kits have been the gold standard for determining IgG concentration in colostrum for well over thirty years, and if the accuracy of those values is affected by freezing colostrum prior to analysis, the validity of much of that data comes into question.

We propose to collect colostrum fresh on farm (75 samples) and determine IgG by both refractometer and by RID. After initial analysis, the fresh samples would be frozen, thawed, and re-analyzed. We would repeat the analysis for two freeze-thaw cycles. This would allow us to determine the accuracy of BOTH types of analysis under these conditions. This data collected in this project would have profound implications for both producers and for the research community.

There are two options for completing this project. Our first option would be to travel to Hilmar, CA and work with area dairies there to collect all the samples we need in a week. This would limit variability due to weather and help improve the accuracy of the data.

The second option would be to use Iowa Jersey producers and travel to the dairies during their heavier calving periods. It would take much longer to collect the data and introduce more variability, but would save the costs of flying out our research team to California and putting them up in hotel rooms.

2012

BEWLEY, Jeffrey, University of Kentucky, Lexington, Kentucky

Differences in core body temperature, lying behavior, rumination behavior and quarter-level milk conductivity using novel precision dairy farming technologies.

DePETERS, Edward J. & Moshe Rosenberg, University of California, Davis, California

Enhancing the Omega-3 Fatty Acid and Beta-Carotene content of Jersey milk.

EASTRIDGE, Maurice & Kristy M. Daniels, The Ohio State University, Columbus, Ohio

Housing system may affect calf behavior and extent of environmental stress on Jersey calves.

HULBERT, Lindsey E., Moshe Rosenberg & Edward J. DePeters, University of California, Davis, California

Enhancing Jersey cow immunity with rumen-protected Omega-3-Fatty Acids and Beta-Carotenoids

PINEDO, Pablo J., Jason Shumaker and Albert DeVries, Texas Agrilife Research, College Station, Texas

Dynamics of culling risk for Jersey, Jersey x Holstein and Holstein cows in large multi-breed dairy herds.

WHITE, Heather M., University of Connecticut, Storrs, Connecticut

Identification of SNPs associated with Ketosis in Jersey cattle.

2012 Research Project Summaries:

Bewley, Jeffrey, A.E. Sterrett, B.A. Wadsworth, J.D. Clark, and C.A. Becker, University of Kentucky, Lexington, KY, Influence of breed, milk yield, and temperature humidity index on dairy cow reticulorumen temperature, lying time, and rumination time.

Objectives: The objective of this study, conducted from October 8, 2012 to January 23, 2013 at the University of Kentucky Coldstream Dairy, was to compare daily lying time (**LT**), reticulorumen temperature (**RT**), and rumination time (**RU**) between 3 breed groups.

Materials and Methods: Cows (n = 36; 12 Holstein (**H**), 12 crossbred (**C**), and 12 Jersey (**J**)) were matched by parity group (**PG**, 1 or ≥ 2 lactations), DIM, and milk yield (**MY**). The Milpro P4C™ (Milkline, Gariga di Podenzano, Italy) provided individual cow milk weights each milking. The DVM Systems, LLC (Boulder, CO) bolus system monitored RT using a passive RFID transponder (Phase IV Engineering, Inc., Boulder, CO) equipped with a temperature sensor queried twice daily by a panel reader placed in parlor entrances. HR Tags™ (SCR Engineers Ltd., Netanya, Israel) measured RU with a microphone and microprocessor, summarized into two-hour time blocks. IceQube® sensors (IceRobotics, Edinburgh, Scotland) recorded daily LT using a 3-axis accelerometer. ProWeatherStation™ (Tycon Power Systems, Bluffdale, UT) weather stations recorded daily temperature and humidity. Weather data was converted to temperature humidity index (**THI**). Mean lying time, RU, RT, MY, and maximum temperature-humidity index were averaged for each cow each day. At least 75 days per cow of recorded LT, RU, and RT data were required for study inclusion. The MIXED Procedure of SAS® (SAS Institute, Inc., Cary, NC) was used to evaluate fixed effects of breed, MY, PG, THI, and their interactions on LT, RT, and RU, with cow within breed as subject.

Results: Mean (± SD) daily DIM, LT, MY, RT, RU, THI were 195.2 ± 105.2 days, 10.8 ± 2.4 hours, 27.5 ± 8.9 kg, 38.8 ± 0.6 °C, 6.2 ± 1.6 hours, and 63.3 ± 16.2, respectively. MY x THI, THI x PG, and breed x PG were significant predictors of RT ($P < 0.01$). Increasing MY and THI increased RT, with the relationship varying by breed. Least squares mean RT for H cows was significantly greater than RT for J and C cows for all PG combinations, except multiparous H cows versus multiparous C cows (Table 1). Greater RT for H cows compared with J and C cows suggests that J and C cows may be more heat-tolerant than H cows. Similar results were obtained by Legates et al. (1991), who explained that MY of J cows were less sensitive to the negative effects of heat stress compared to H cows. Breed x PG and MY were significant predictors of RU ($P < 0.01$). As MY increased, RU also increased, which may be related to increased feed consumption related to greater milk production. Similar results were obtained by Norring et al. (2012), who cited that greater producing cows spent more time ruminating and less time lying than lesser producing cows. Least squares mean RU for H cows was significantly greater than RU for J and C cows for all PG combinations except primiparous H cows versus multiparous J cows (Table 2). Increased RU for H cows may be a result of greater feed intake for H cows because of their larger body size and greater milk production. Breed x PG, breed x MY, and THI were significant predictors of LT ($P < 0.01$). As maximum THI increased, LT decreased. Similar results were observed by Cook et al. (2007), who described that mean LT decreased by 3 hours/day from the coolest to the hottest day observed. Cows may stand more during greater ambient temperature periods because of increased surface area exposure. Least squares mean LT for H cows was significantly greater than LT for J and C cows, except for primiparous H cows versus multiparous J cows (Table 3).

Table 1. Least squares mean (± SE) reticulorumen temperatures recorded by DVM Systems, LLC bolus system (Boulder, CO) by breed and parity[1]

Parameter	Primiparous Holstein	Multiparous Holstein	Primiparous Jersey	Multiparous Jersey	Primiparous crossbred	Multiparous crossbred
Reticulorumen temperature (°C)	39.16 ± 0.07[a]	38.47 ± 0.04[c]	38.22 ± 0.07[d]	38.75 ± 0.05[b]	38.88 ± 0.06[b]	38.50 ± 0.05[c]

[1]Least squares means within rows with different superscripts differ ($P < 0.05$).

Table 2. Least squares mean (± SE) rumination times recorded by HR Tags™ (SCR Engineers Ltd., Netanya, Israel) by breed and parity[1]

Parameter	Primiparous Holstein	Multiparous Holstein	Primiparous Jersey	Multiparous Jersey	Primiparous crossbred	Multiparous crossbred
Rumination time (hours/day)	6.30 ± 0.14[a]	5.87 ± 0.09[c]	5.85 ± 0.14[b]	6.30 ± 0.11[a]	5.75 ± 0.12[b]	6.10 ± 0.10[b]

[1]Least squares means within rows with different superscripts differ ($P < 0.05$).

Table 3. Least squares mean (± SE) lying times IceQube® sensors (IceRobotics, Edinburgh, Scotland) by breed and parity[1]

Parameter	Primiparous Holstein	Multiparous Holstein	Primiparous Jersey	Multiparous Jersey	Primiparous crossbred	Multiparous crossbred
Lying time (hours/day)	10.91 ± 0.21[b]	12.19 ± 0.14[a]	9.81 ± 0.26[c]	10.74 ± 0.17[b]	10.08 ± 0.18[c]	9.40 ± 0.15[c]

[1]Least squares means within rows with different superscripts differ ($P < 0.05$).

Future: The physiological and behavioral differences between Holstein, Jersey, and crossbred cows observed in this study provide new insight into breed differences that can be useful for interpreting technology data. Further analyses of the data will be conducted over the summer and a manuscript will be submitted to be published in the Journal of Dairy Science in the fall. The researchers are very appreciative to the American Jersey Cattle Association for their generous donation to fund this research project.

DePeters, Edward J., and M. Rosenberg, University of California, Davis, CA, Enhancing the Omega-3 Fatty Acid and Beta-Carotene Content of Jersey Milk.

and Hulburt, Lindsey E., M. Rosenberg, and E.J. DePeters, University of California, Davis, CA, Enhancing Jersey cow immunity with rumen-protected Omega-3-fatty acids and Beta-carotenoids.

Currently, we do not have anything to report. We have experienced technical problems with respect to making gels for the experiment. The campus food processing plant is new so the equipment is new, and the new homogenizer that we need to make the gels has caused one problem after another. We have had long down times until the service rep could come to make repairs, etc. We will be moving soon to a small lab homogenizer to try making gels of a small size to feed. We have been to Cal Poly SLO to try their equipment and found that, if necessary, we can make the gels there, however the distance creates a problem. We have been working on the project, but we cannot get the gels made that we need to do the feeding study. When this study was proposed I did not anticipate the technical problems. Making gels is not that difficult, but the equipment we have makes it challenging.

Eastridge, Maurice, and K.M. Daniels, The Ohio State University, Columbus, OH, Housing System May Affect Calf Behavior and Extent of Environmental Stress on Jersey Calves.

Objectives: Determine if pair-housing Jersey calves in hutches helps to reduce cold stress during the winter but not contribute to heat stress during the summer, determine the relationship between different measures of body SA and body temperature of calves, and Determine the extent of cross-suckling in Jersey calves fed via bucket and pair-housed versus those housed in individual hutches.

Materials and Methods: This study was conducted at The Ohio State University's Waterman Dairy Center, located in Columbus, Ohio. Forty Jersey heifer calves were allocated to either individual or paired housing treatments at birth and monitored for 9 wk. Calves were housed in hutches (non-tethered, wire pen enclosure), and both individually (n = 20) and pair-housed calves (n = 20) were provided with one hutch. The size of the pen enclosure for calves housed in pairs was double that provided to calves housed individually. Blood samples were collected in 5-mL Vacutainer serum collection tubes (BD Vacutainer Plus Blood Clot Collection Tubes, Franklin Lakes, NJ) via jugular venipuncture within 48 h after birth. Total serum protein levels were analyzed using a JorVet clinical hand-held refractometer (Jorgesen Laboratories, Inc., Loveland, CO). All calves used in the study had a total serum protein level > 5.5 g/dl.

Feed: All calves were fed Land O' Lakes Cow's Match Jersey Blend (Shoreview, MN) powdered milk replacer (28% CP, 25% fat) via bucket twice daily (1.9 L/feeding for the first wk, then increased to 2.27 L/feeding until weaned) and had ad libitum access to Land O' Lakes texturized starter grain (Shoreview, MN) formulated for Jersey calves (90% DM, 22% CP) and water. At 49 d of age, calves were decreased to one milk feeding per day and weaning occurred on d 56.

***Performance*:** Grain consumption was monitored on a daily basis by the collection of feed refusals. Refusals for pair housed calves were averaged, as it was not possible to monitor individual feed intake among calves housed in pairs. Calves were also weighed weekly to calculate ADG. Hip and wither heights and body length measurements were taken at birth, 3, 6, and 9 wk of age.

Health: Fecal scores (4-point scale) and rectal body temperature were recorded on a daily basis throughout the experiment. In order to obtain measures of continuous core-body temperature,

wireless temperature data loggers (DS 1922T Thermochron iButton, Maxim Integrated, San Jose, CA) were coated in silicon and secured under the base of the tail of randomly selected calves (balanced among treatments). Wireless digital thermometers (AcuRite Wireless Digital Thermometers) were also mounted above the straw inside of each calf hutch to monitor daily high and low temperatures within the hutch.

Behavior: Direct behavior observations were conducted on a weekly basis during 1 h observations periods centered around morning and evening milk feedings (approximately 500 and 1600 hours, respectively). Trained observers walked in full view of the experimental calves and obtained a mutually exclusive, instantaneous scan-sample by recording each calf's posture (lying or standing) and demonstrated behavior once every minute. Behavior categories included: idle, other, interacting with pen fixtures, object play, self-grooming, locomotor play, feed ingestion, water ingestion, and milk ingestion. Social behaviors specific to calves housed in pairs included: cross-sucking, allogrooming, and social play.

The in vivo portion of this experiment was completed on Monday, April 22, 2013. Preliminary results are provided below in Figure 1 through 3 and include: Performance results: 36 calves; n =18 for calves housed in pairs and n = 18 for calves housed individually. Behavior results: 18 calves; n = 12 for calves housed in pairs and n = 6 for calves housed individually.

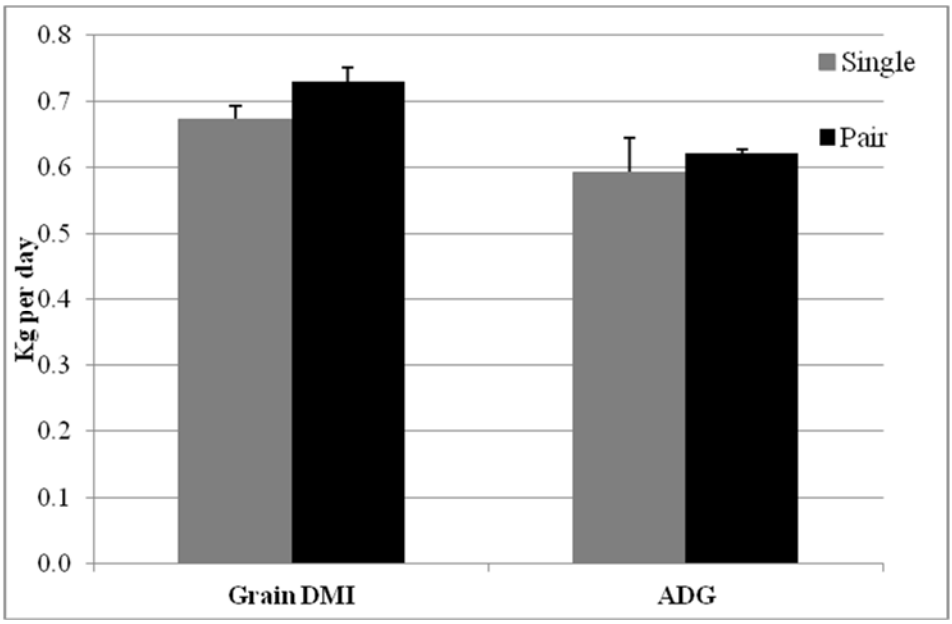

Figure 1. Grain DMI (kg/d) and ADG (kg/d) for calves housed in pairs (n = 18 calves) or individually (n = 18 calves).

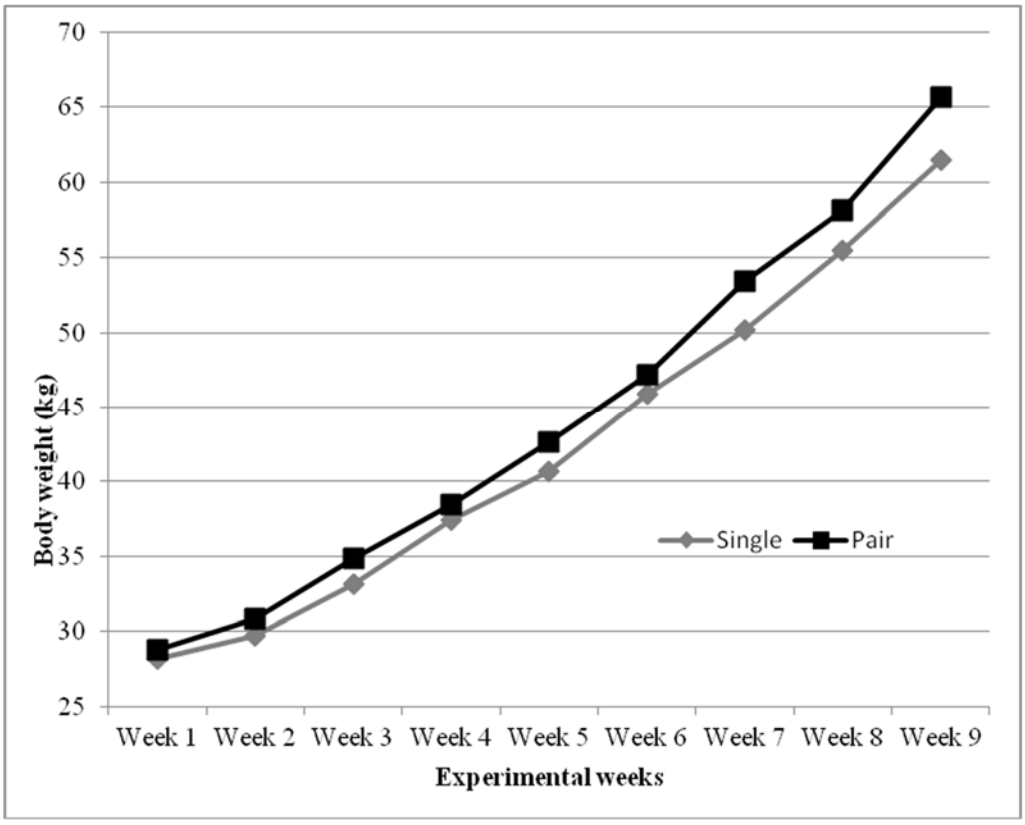

Figure 2. Mean body weight (kg) for calves housed in pairs (n = 18 calves) or individually (n = 18 calves) during the milk feeding and weaning periods.

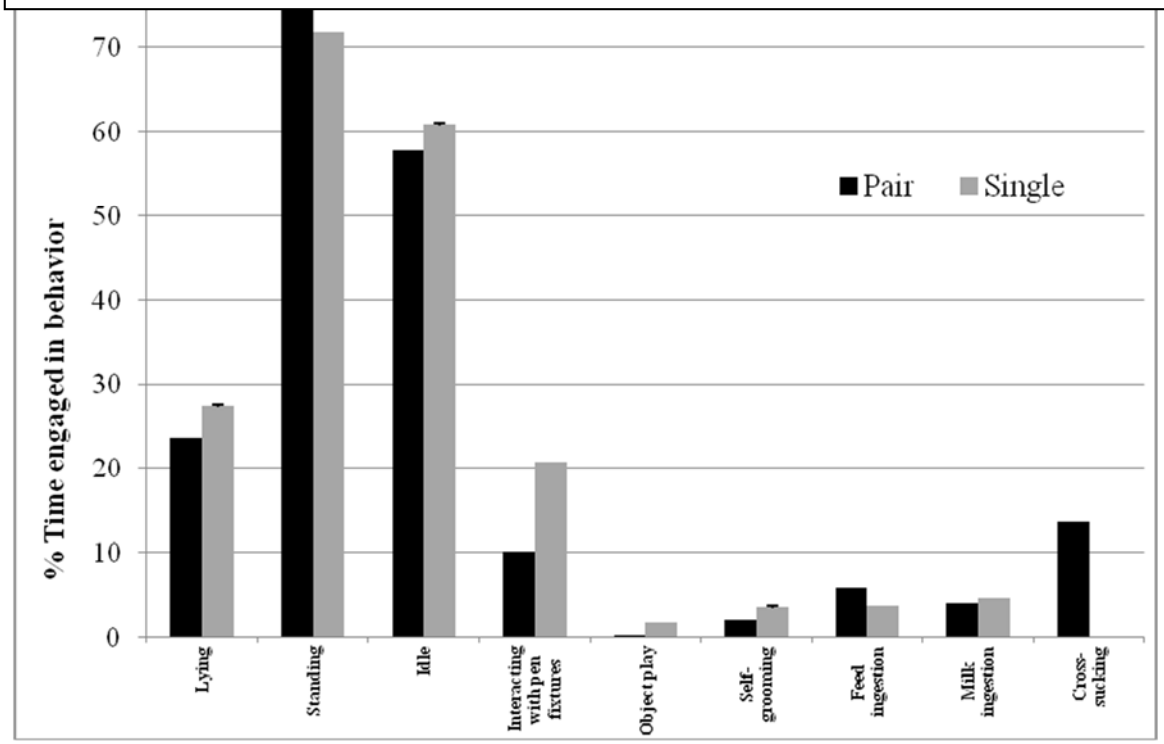

Figure 3. Mean (± SEM) percentage of time calves housed in pairs (n = 12 calves) or individually (n = 6 calves) spent engaged in each behavior.

Pinedo, Pablo J.[1], J. Shumaker[2], A. Daniels[3], A. DeVries[4], Dynamics of culling risk for Jersey, Jersey x Holstein, and Holstein cows in large multi-breed dairy herds.

[1]Texas AgriLife Research-College of Veterinary Medicine & Biomedical Sciences, Texas A&M University, Amarillo, Texas, USA

[2]Magnolia Veterinary Services, Amarillo, TX

[3] Circle H Headquarters, LLC, Dalhart, TX

[4] Department of Animal Sciences, University of Florida, Gainesville, Florida, USA

Objectives: To describe the dynamics of culling risk of Jersey cows by disposal reason considering parity, stage of lactation, milk yield, reproductive status, herd milk yield, and herd size. Also, to explore associations between culling dynamics and type traits, to identify management related risk factors, and to compare the survival ability between Jerseys (J), Holsteins (H), and their crosses (X) in multi-breed dairy herds in Texas.

Current status: After edits, the study analyzed 202,309 lactation records from cows calving since Jan 2007 to 2011 in 16 large herds located in Texas that included Jerseys, Holsteins and J x H crosses. The distribution of records by breed was: Jersey = 38.7%; Holstein = 29.1%, J x H cross = 17.7%, and other crosses and not identified = 14.4%. The distribution of lactation records by parity number was: 1st = 35.9%; 2nd = 27.7%, 3rd = 18.0%, ≥4th = 18.3%. Reasons considered for culling were: Sickness, low productivity, breeding, injury-sick, died, mastitis, and abort. Sale for dairy proposes was not considered culling and consequently excluded from the analysis.

Preliminary results:

- The annualized risk of culling (overall) by breed was: Jersey = 32.1%; Holstein = 34.9%, and Jersey x Holstein cross = 30.1%.
- Low productivity was the main reason for culling followed by death and mastitis.
- The main reason for culling during early lactation was death followed by the category injury-sick, and this finding was consistent for J, H and X cows.
- Across all the breeds, low productivity and breeding were the main culling reasons reported at advanced DIM (>380 d).
- The highest risk of culling due to mastitis was between 45 and 180 DIM.
- The risk of culling for open cows was about 4 times the risk of pregnant cows.
- Jersey cows had the highest survival rate during the first lactation (79.4%) and were also superior to Holsteins in the 2nd, 3rd and 4th or higher lactation.

Work in progress:

- Preparation of charts and tables reporting significant results (culling risk by disposal reason considering parity, stage of lactation, milk yield, reproductive status, herd milk yield, and herd size).

- Construction of final logistic regression models for the analysis of potential management related risk factors affecting survival.
- Analysis of the association between type traits and the reason and time of culling (data available for a reduced Jersey subpopulation).
- Manuscript preparation.

Note: Please consider these results as preliminary and subject to some degree of variation until final analysis.

White, Heather M., University of Connecticut, Storrs, CT, Identification of SNPs Associated with Ketosis in Jersey Cattle.

Objectives: Improving individual Jersey cattle health and productivity greatly improves whole herd profitability. The transition to lactation period is a critical time for dairy cattle and impacts both immediate lactation productivity as well as cow longevity and health. This project focused on identifying genetic markers for the onset of metabolic disorders, such as ketosis and fatty liver and the resulting decreases in profitability through treatment cost, lost milk, reduced reproductive efficiency, increased management time, necessary culling, and replacement cattle. Specifically, the objective of this project was to identify SNPs that are uniquely expressed in Jersey cattle with clinical ketosis, compared with metabolically healthy Jersey cattle, to identify potential culprits for genetic predisposition.

Materials and Methods: During the last year, we have collected hair and serum samples from 54 cows representing six New England Jersey farms. Ketotic cattle were identified by producers, the PI notified, and samples collected from the ketotic cow and a healthy herd mate. Ketosis was verified cow-side using the Precision Xtra blood beta-hydroxybutrate (BHBA) meter. Serum samples were used to determine both BHBA and nonesterified fatty acid (NEFA) concentrations for each cow. Hair samples were used for the 50K SNP chip and final SNP chip data was just received from the USDA collaborator of American Jersey Cattle Association in April.

Status Update: Genetic data are being interrogated by the PI and the genomics group at the University of Wisconsin-Madison, Department of Dairy Science, to account for herd, parity, ketotic status (both as finite presence and exact BHBA concentration), NEFA concentration, daily milk production, ME305 milk production, in pathway-of-interest and genome wide association study analyses. We anticipate these complex genome wide analyses to be completed within two months. Analyses will reveal genes or pathways that are consistently different between ketotic and healthy cattle, based on SNP analysis. Future research will focus on validating potential markers of ketosis in order to determine the strength of the marker for potential use by the American Jersey Cattle Association and Jersey producers as a marker of genetic predisposition for ketosis. This new knowledge will allow for targeted prevention and treatment strategies for ketosis in predisposed cattle and thus, result in increased production and profitability.

2013

CABRERA, Victor E. & Kent A. Weigel, University of Wisconsin, Madison, Wisconsin

Development of a genomic testing decision support tool for Jersey dairy calves.

MORRILL, Kim, Cornell Cooperative Ext., Canton, New York, Heather Gauthier, Miner Institute, Chazy, New York, & Howard Tyler, Iowa State University, Ames, Iowa

The use of digital refractometers to evaluate serum IgG concentration in day old Jersey calves and colostrum management practices of Jersey producers in New York.

ELLISON, Brenna, University of Illinois, Urbana, Illinois & Kathleen Brooks, West Texas A&M, Canyon, Texas

Are consumers buying what Jersey producers are trying to sell? Understanding consumer preferences for milk and enhancing the All-Jersey and Queen of Quality brands.

GOULD, Brian W., University of Wisconsin, Madison, Wisconsin

A Web-Based System for Evaluating Class III Forward Price Contract.

2013 Research Awarded Project Updates:

Cabrera, Victor E. and Kent A. Weigel**,** University of Wisconsin, Madison, WI, **Development of a genomic testing decision support tool for Jersey dairy calves.**

Objectives: Development of a state-of-the-art decision support tool to help Jersey dairy farmers decide whether to use genomic testing on their heifer calves and if so, find out the economically optimal testing management strategy protocol that includes the proportion of animals to be genomic tested and the selection pressure based on test results

Current Status: The decision support tool, offered as main product of this project, has been completed (Figures 1 through 4). At the moment, the *"Integrated Genomic Testing for Jersey Heifer Calf Decision Support Tool"* is internally being tested for consistency and dependability. Also, we are in communication with Cari Wolfe to integrate the tool with Jersey datasets: The goal is that Jersey Association members be able to retrieve their live-updated heifer data (heifer identification, Jersey Performance Index (JPI) or net merit (NM$), and reliability) directly from the database associated to the decision support tool. At the moment, we are connecting a "static" dataset of a few Wisconsin Jersey herds (provided by Cari Wolfe) to the decision support tool: Data can be retrieved using herd codes. Later, in coordination with AJCA, it is also planned to link the tool to some official sites of the Jersey Association (Greenbook.USJersey.com; InfoJersey.com; USJersey.com).

Materials & Methods: The decision support tool conforms to all characteristics and specifications originally offered. In addition, during the development process, we deemed appropriate to include and improve further some of the tool components. Two clear examples are: 1) the inclusion of sexed semen use as an option (Figure 2) and 2) the optimized selection of genomics scheme (Figure 3).

Regarding example 1), the gain of using genomics is highly dependent on the availability of replacements and its relationship with the need of replacements. Hence, the higher the positive balance between supply and demand, the higher the gains. Therefore, it makes economic sense to include the possibility of using sexed semen to increase the availability of replacements.

Regarding example 2), under diverse and farm-specific conditions, it makes sense to include an optimization module that iteratively finds the best subset of heifers suggested to be tested for the greatest gains according to farm potential selection pressure.

The decision support tool, at different stages of development, has been discussed with Cari Wolfe and demonstrated in at least 3 UW-Madison Dairy Science Department classes. Students from these classes were exposed and able to experiment and interact with the tool. Furthermore, they were able to internalize the concept of using genomic tests in dairy heifers. Some of these students, being Jersey farmers, were able to further test the tool using their farm data and conditions, and sharing it with other family members and farms' decision-makers. We have had very positive and encouraging feedback regarding the decision support tool.

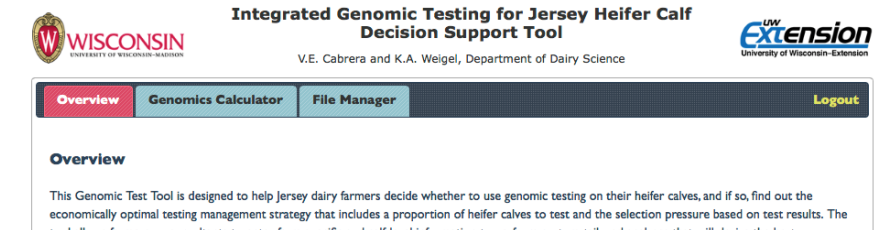

Figure 1.

Screenshot of the Overview and Acknowledgement tab of the "Integrated Genomic Testing for Jersey Heifer Calf Decision Support Tool"

Figure 2. Screenshot of the *Genomic Calculator* tab of the "*Integrated Genomic Testing for Jersey Heifer Calf Decision Support Tool,"* steps 1 through 3. User enters own heifer data in *Step 1*, calculates the required calves to maintain the herd size in *Step 2*, and adjust this value and enters test costs and parentage error in *Step 3.*

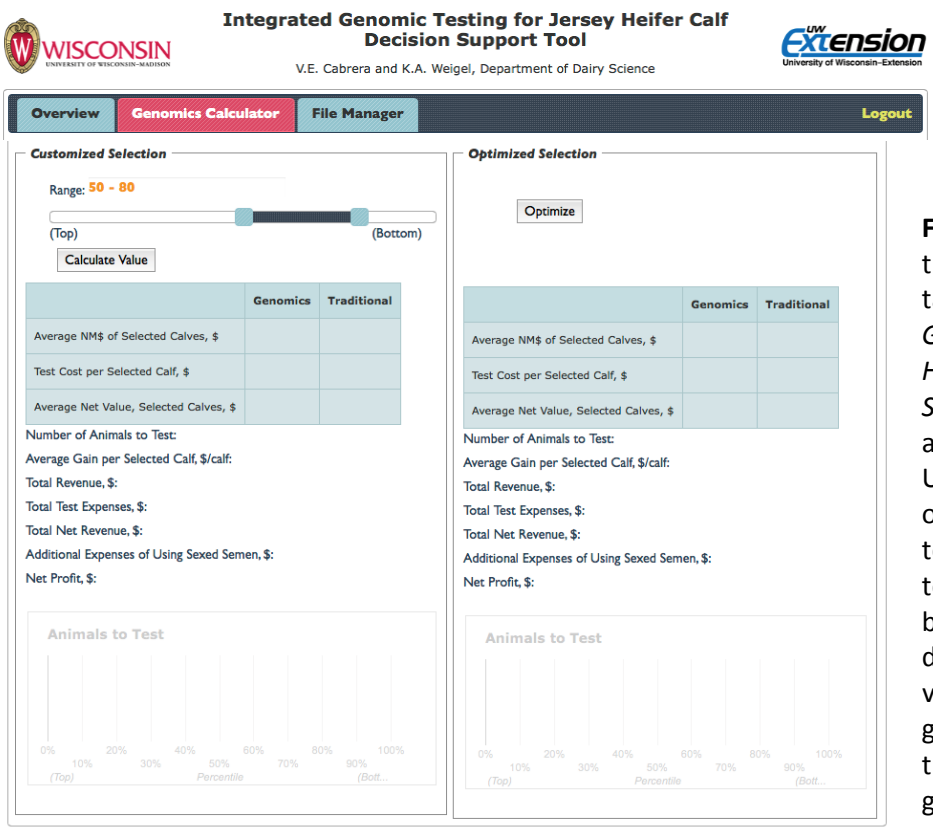

Figure 3. Screenshot of the *Genomic Calculator* tab of the "*Integrated Genomic Testing for Jersey Heifer Calf Decision Support Tool*," customized and optimized selection. User either enters a range of heifers to be genomic tested or request to the tool's algorithm find the best selection. Results are displayed in economic values comparing the genomic testing against the traditional (no genomic testing).

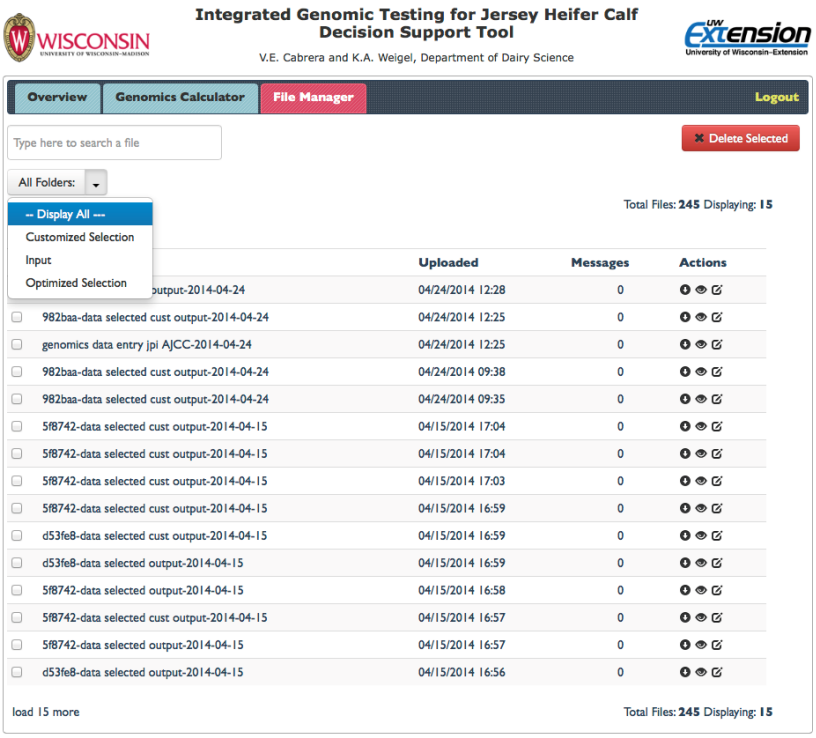

Figure 4. Screenshot of the *File Manager* tab of the "*Integrated Genomic Testing for Jersey Heifer Calf Decision Support Tool*." Users are registered to the system (logged in) and have the capability to save their data and analyses. This tab will be modified to accommodate AJCA and retrieve directly their data using their herd code.

Ellison, Brenna, University of Illinois, Urbana, IL and Kathleen Brooks, West Texas A&M University, Canyon, TX, **Are Consumers Buying What Jersey Producers Are Trying to Sell? Understanding Consumer Preferences for Milk and Enhancing the All-Jersey and Queen of Quality Brands**

Objectives: The overall objective of this project is to gain a better understanding of consumer preferences for Jersey-derived products. More specifically, this project will:

- Determine which milk attributes (price, taste, production method, shelf life, fat content, etc.) are most and least important to consumers (both Jersey and non-Jersey consumers),
- Determine consumers' knowledge and perception of the All-Jersey/Queen of Quality labels,
- Estimate consumers' willingness to pay for products bearing the All-Jersey/Queen of Quality labels, and
- Identify strategies to increase consumer awareness, acceptance, and purchases of Jersey-derived products.

Data Collected and Preliminary Results: Since our last progress report, we have conducted six focus groups on the University of Illinois campus in Urbana, IL. In total, we had 47 focus group participants. Key insights from the focus group were:

1. Consumers have very little knowledge on breed differences and how that would affect milk quality (not surprising, given our pilot data results).

2. When looking at one Queen of Quality labeled product (compared to others), only a handful of participants even noticed the Queen of Quality seal. It was located in the bottom corner of the label and was not even noticeable in their opinion. Those that did notice it mentioned they did not know what the label meant.

3. After giving a brief discussion on the differences between Jersey and Holstein cows (related to production volume, protein content, fat content, calcium content, and environmental impact per the Capper and Cady study), our respondents found the increased nutritional benefits to be the most appealing part of the Jersey "brand."

4. While our sample was a bit younger (due to college campus recruiting), they did have some ideas for improving branding:

a. Use a QR code on the milk gallon cap which consumers could scan to learn more about the benefits of consuming Jersey milk (or cheese).

b. Display a panel on the side of the gallon jug comparing the nutritional content between Jersey and Holstein milk (maybe emphasize environmental aspects on cheese).

c. Redesign the current Queen of Quality logo to make it more informative as to what makes a product with this label different from the rest.

d. Build on the "Milk Life" campaign that emphasizes the protein benefits of milk, especially since Jersey milk has an even higher protein content than regular milk – perhaps, market products in gyms, nutrition supplement stores (GNC), etc.

e. Utilize modern media platforms (Buzzfeed, Facebook, Twitter, Instagram, etc.) to get the word out about the benefits of Jersey products.

f. Help producers seek out connections and/or contracts with local school systems to serve Jersey milk during the school lunch time – improved nutrition in schools is a high priority across the nation.

Future Plans: Since there is limited familiarity with the Queen of Quality label, it is difficult to estimate what consumers are willing to pay for products displaying this label. However, from our focus groups, we have learned which features of Jersey products are most valuable to consumers, so we want to determine the value of having a higher protein and calcium content. This should help inform what type of premium the Queen of Quality label could generate if awareness is improved. To do this, we are currently conduction a nationwide online survey. We are also finishing up a second survey to learn more about consumers' preferences for different production methods (no antibiotics, no growth hormones, humanely-raised, organic, etc.) to help producers learn which methods are most worthy of advertising.

Gould, Brian W., University of Wisconsin, Madison, WI, **A Web-Based System for Evaluating Class III Forward Price Contract.**

Objective: Development of a web-based application that can be used by operators of Jersey-based dairy farms to assist with the decision of whether to accept a plant-supported fixed/minimum milk price contract. Given the offer of a fixed price, if the producer's basis is known then the implied Class III price can be determined based on the following relationship:

Offered Fixed Price = Class III price + Basis → Offered Fixed Price – Basis = Class III price (1)

Status Update: We have made significant progress in developing the Forward Price Contract (FPC) analyzer. The following tasks have been achieved. We have developed a(n):

1. Software system that accesses our database of Class III and IV futures contracts to be used to forecast future farm specific mailbox prices.

2. System that allows a producer to create their own database containing

a. Historical and current mailbox prices

b. Farm-related data such as herd size, per cow productivity, milk composition

c. Secure account login to protect producer data.

3. Graphical analysis system to display producer's mailbox prices.

4. System where a regression analysis of the producer's mailbox prices is undertaken and regression related statistics are presented.

5. Forecasting system applied to farm specific mailbox prices. This system is based on:

a. Regression analyses of farm-specific mailbox prices b. Current futures prices for the next 12 months.

6. A preliminary input form by which fixed price, minimum price and other forward contract information can be added to the producer database. Types of information input include:

a. Type of contract

b. Price characteristics of contract

c. Time period covered by each contract and milk covered

d. Contract cost

e. Other characteristics

Future Plans: The following is a list of activities that need to be undertaken to complete the project:

1. ***Further develop the web page to incorporate forward price contract(s) characteristics***: A preliminary version of this form has been developed. Further development is required to catalogue and display the outstanding forward contract commitments.

2. ***Develop a graphical display of the implied price path compared to the producer's forecasted mailbox prices***: This activity will account for a majority of our remaining efforts.

3. ***Provide an Evaluation of farm-specific (Mailbox – Class III) basis***: We will create a table that shows the historical mailbox – Class III basis. We will display series statistics such as minimum, maximum, mean, seasonality, etc. We will evaluate forecasted mailbox bases and compare it with the basis implied by existing forward contract(s) entered into the producer.

4. ***Provide a What-If analysis of possible forward price contracts***: For contracts being considered, the mailbox price and basis characteristics will be analyzed.

Morrill, Kim, Cornell Cooperative Extension**,** Canton , NY, Heather Gauthier, Miner Institute, and Howard Tyler, Iowa State University , **The use of digital refractometers to evaluate serum IgG concentration in day old Jersey calves and colostrum management practices of Jersey producers in New York.**

***Note from the author: We ended up breaking the project into two abstracts for the ADSA-JAM;

ABSTRACT 1:

Current colostrum management practices on Jersey farms in Vermont and New York State,

Kimberley Morrill, Michaela Spring & Howard Tyler.

Objective: The objective of this study was to evaluate current colostrum management practices on Jersey farms in New York and Vermont. Colostrum management surveys consisting of seven general farm questions and 24 colostrum management questions were mailed to 75 dairy farms in New York and Vermont in June of 2013.

Data Collection: A total of 38 farms responded to the survey (50.66%). Of the 38 farms that responded, 10 provided calf serum for IgG analysis. Farms represented conventional (56%), organic (3%) and combinations of conventional and grazing (41%) operations. Farm size ranged from < 100 cows (67%), 100 to 199 (15%), 200 to 500 (10%), 501 to 1000 (5%), 1001 to 2,000 cows (3% of respondents). Colostrum collection occurred within 1 hour on 16% of farms and within 6 hours on an additional 58% of farms. Fresh cows were milked most often in the same parlor as the rest of the herd (69%) and were frequently milked last (52%). Colostrum was transferred to an average of 2.32 containers (SD = 0.47) prior to feeding. Mean time to first colostrum feeding was 7.79 hours (SD = 7.62); 24% of farms surveyed fed calves within 1 hour, 33% within 2 hours of birth, 35% within 6 hours of birth and 8% of calves were fed within 12 hours of birth. Mean colostrum consumption within the first 24 h was 3.00 L (SD = 1.11) with a range of <1 (3% of farms) to > 4.5 L (13% of farms).

Results: Colostrum quality was a concern on 55% of the farms and was assessed on 78% of the farms. The most common methods of assessment was to evaluate color and consistency of colostrum; only one farm was using a refractometer to measure colostrum quality. The majority of farms surveyed (82%) would discard unacceptable colostrum. The following conditions led to discarding colostrum on greater than 20% of farms surveyed: mastitis, sick cow, positive for Johne's or Leucosis, watery appearance, or bloody appearance. Only one farm routinely monitored passive transfer in newborn calves. These data suggests that farms in this study are willing to discard colostrum from sick cows or visible altered (bloody), however colostrum management practices on Jersey farms in New York and Vermont have room for improvement, primarily in timing of feeding, amount of quality colostrum fed within 24 hours and assessment of passive transfer.

Colostrum management practices on Jersey farms in New York and Vermont have room for improvement, primarily in timing of feeding, amount of quality colostrum fed within 24 hours and assessment of passive transfer.

Future plans:

- Work one on one with producers to develop on farm colostrum and calf protocols. If a problem arises, it is usually easier to track down where the challenge is coming from if a protocol is in place.

- Develop overarching programs and protocols that can be developed and shared via the web and news articles for all producers to have access to.

ABSTRACT 2:

Estimate of serum immunoglobulin G concentration in Jersey calves using a digital refractometer

Michaela Spring, Kimberley Morrill & Howard Tyler

Objective: The objective of the present study was to validate the use of a digital refractometer to determine serum IgG concentrations and evaluate failure of passive transfer in Jersey calves.

Materials & Methods: Blood samples (n=108) were obtained from 1-3 day old Jersey calves. The mean serum IgG concentration for all calves was 23.7 mg/ml, with a range of 2.2 to 65.0 mg/ml. Serum %Brix was positively correlated with IgG concentration. A 7.3% Brix cut-point resulted in the greatest percentage of samples being correctly classified (92.59 and 93.52%, respectively) and the best combination of diagnostic test characteristics. Our data suggest that a digital refractometer is an acceptable, rapid and low cost method to estimate IgG concentration in Jersey calf serum but that breed-specific cut points should be used.

Results:

- A digital refractometer can be used to determine failure of passive transfer in Jersey calves between 1 to 3 days of age.

- A %Brix value of 7.3% should be used to determine if a JERSEY calf has achieved adequate passive transfer whereas a %Brix value of 7.8% has been recommended for Holstein calves (Morrill et al., 2012).

2014

MALTECCA, Christian and Jeremy Howard, North Carolina State University, Raleigh, North Carolina

Genomic regions that impact inbreeding depression across AU and US Jersey cow populations.

SPURLOCK, Diane, Iowa State University, Ames, Iowa

Investigation of Surface Body Temperature as an Indicator of Feed Efficiency in Jersey Cattle

WEIGEL Kent, University of Wisconsin, Madison, Wisconsin

Selection for Lifetime Net Profit in Jersey Cattle

GOULD Brian, University of Wisconsin, Madison, Wisconsin

Predicting Jersey Herd Milk Quality, Value and Margins: A Stochastic Analysis Using Farm and Market Level Data

2014 Project Summaries

Maltecca, Christian and Jeremy Howard, North Carolina State University, Raleigh, North Carolina, Genomic regions that impact inbreeding depression across AU and US Jersey cow populations.

The widespread adoption and use of genomic information to make selection decisions have been seamlessly introduced into the dairy industry. Interest and concern regarding inbreeding continue to grow as breeders search for ways to avoid the economic losses associated with inbreeding depression and slower progress resulting from homozygosity. Therefore characterizing the inbreeding heterogeneity across the genome and more importantly of that region on a economically important trait such as fertility or yield traits is the objective of this study.

Spurlock, Diane, Iowa State University, Ames, Iowa, Investigation of Surface Body Temperature as an Indicator of Feed Efficiency in Jersey Cattle

As feed costs continue to rise, the efficiency with which cows convert feed to milk will be increasingly important to the economic success of dairy enterprises. Current selection indexes do not select for improved feed efficiency because of the cost and labor associated with recording feed intake phenotypes. However, measurement of alternative traits that are highly correlated with feed efficiency may offer a cost effective alternative for selection for improved feed efficiency. This proposal is based on the hypothesis that cows efficient at converting feed to milk are efficient in part due to a reduced loss of energy as heat. Thus, we hypothesize that variation in surface body temperatures are correlated with feed efficiency such that efficient cows lose less energy as heat and maintain cooler body surface temperatures. The primary objective of this proposal is to evaluate the use of surface body temperature, measured by infrared thermography, as an indicator trait for feed efficiency. To accomplish this objective, we will measure individual daily feed intake on 36 Jersey cows at the Iowa State University Dairy. Feed intake will be measured for eight weeks when cows are in mid-lactation. Milk production and composition, and body weight and condition score will also be recorded to enable calculation of feed efficiency. Infrared thermal imaging will be used to capture thermal images of selected body locations, and average surface temperatures will be determined. Phenotypic correlations between surface body temperatures and feed efficiency traits will be calculated. A significant phenotypic correlation is a critical first step in the identification and validation of surface body temperature as an indicator trait for feed efficiency. If successful, this technology could provide a cost effective alternative to measuring individual feed intake for section for improved feed efficiency in Jersey cattle.

Weigel, Kent, University of Wisconsin, Madison, Wisconsin, Selection for Lifetime Net Profit in Jersey Cattle

The objective of the proposed research is to provide updated estimates of genetic parameters and economic weights for the Jersey Performance Index (JPI), such that Jersey breeders will continue to achieve rapid genetic progress and maximize farm profitability. The JPI was last updated in 2010 and was previously updated in 2006; in both cases updates were the direct result of research carried out by Ron Pearson and colleagues at Virginia Tech.

Updating economic weights periodically is critical with regard to achieving optimal genetic progress, for several reasons. First, input costs (e.g., feed costs, replacement heifer prices) change over time, as do

output values (e.g., milk prices, cull cow prices). Second, performance of the cow population changes over time due to genetic progress and implementation of new management tools and technologies (e.g., improvement of milk yield, deterioration of female fertility). Third, genetic and phenotypic relationships between traits change over time, and these changes must be accommodated to avoid unexpected correlated responses to selection (e.g., changes in the correlation between milk yield and productive life due to evolution of culling policies). In the project described herein, an updated sample of data from the US Jersey cow population will be used to compute estimates of heritability and genetic correlation parameters for production, type, and health traits. This information will be coupled with data regarding input and output costs for the purpose of calculating new economic weights that can be implemented in the 2014 version of JPI. The breeding goal will be lifetime relative net income adjusted for opportunity costs (ARNIOC), as in previous work by Dr. Pearson, but alternatives such as relative net income per day of productive life (RNIDPL) will also be considered.

Gould, Brian, University of Wisconsin, Madison, Wisconsin, Predicting Jersey Herd Milk Quality, Value and Margins: A Stochastic Analysis Using Farm and Market Level Data

Margin volatility for Jersey (and other) dairy farm operators has been a problem since 1995 when the component based milk pricing was adopted by the Federal Milk Marketing Order (FMMO) system. With an increasing reliance on foreign markets as a destination for U.S. manufactured dairy products, price and margin volatility may still continue to be an issue even with future milk pricing reform. This is evidenced by the domestic dairy market conditions that existed after Oct. 2008.

The proposed project will use the structure of the FMMO pricing system along with current futures/options data to evaluate likely milk component levels and values over the near term. A regression analysis will be used to evaluate factors that can explain milk component levels using a unique panel data set that will be obtained from the FMMO #30 market administrator's office should this project be funded. A web-based application will be developed to (i) allow Jersey farm operators to input their own milk quality data should they desire to evaluate a farm specific component regression; (ii) enable Jersey farm operators the ability to obtain component composition and value projections based on either the FMMO #30 farm panel or their own farm’s regression results; and (iii) provide both a point estimate as well as a probability distribution of expected component values, milk value, feed costs and dairy income over feed costs in the near term (i.e., 12 months).

2015

Adams Progar, Amber, Washington State University, Pullman, WA

Effectiveness of Calf Jackets to Improve Growth and Health in Jersey Calves during Cold Weather

Genger, Nicolas, Université de Liège

Predicting Body Weights throughout the Lactations Using the AJCA Uniform Functional Type Traits Appraisal Program

Poock, Scott, University of Missouri, Columbia, MO

Level of BHBA, NEFA, Glucose, and Progesterone in the First 4 Weeks of Lactation and Subsequent Fertility and Production

2015 Project Summaries

Adams Progar, Amber, Washington State University, Pullman, WA, Effectiveness of Calf Jackets to Improve Growth and Health in Jersey Calves during Cold Weather

In 2006, 7.8% of pre-weaned heifer calves died on dairy farms across the United States. Higher incidences of calf morbidity and mortality occur during cold or hot weather conditions when calves expend additional energy to regulate their internal body temperature. This redistribution of energy sources often leads to decreases in calf growth during the pre-weaning period. Dairy producers implement several different management practices to reduce the impact of weather conditions on calf health and growth, including the use of calf jackets during cold weather. We know that calf jackets can cause a 52% increase in overall animal insulation in Holstein calves, and in turn, improve average daily gain by 0.2 lbs/day. However, no information is available on whether these jackets benefit Jersey calves. Our primary objective in this study is to evaluate the effects of calf jackets on Jersey calf body temperature, growth, and health during cold weather. Once we determine the effectiveness of calf jackets to improve growth and health in Jersey calves, Jersey cattle producers will be able to determine whether using calf jackets on their dairies is economically prudent.

Genger, Nicolas, Université de Liège, Predicting Body Weights throughout the Lactations Using the AJCA Uniform Functional Type Traits Appraisal Program

The AJCA Uniform Functional Type Traits Appraisal Program generates linear scores to describe each appraised cow. Evaluators score 16 primary conformation traits, plus five supplemental traits and assign a Final Score. Scores are currently used, both to support the improvement of the US Jersey breed for functional type, longevity and profitability through the current AJCA Type Genetic Evaluation System but also to help breeders manage and promote their animals and their herds. The first objective of this proposal is to add value to the AJCA Uniform Functional Type Traits Appraisal Program by using the generated linear type scores in an innovative way as predictors of body weight (BW). The proposal will therefore develop a method to add for each classification record a prediction of BW based on available linear type scores. Unfortunately, given the usual schedule of herd appraisals (every 7 to 10 month) few animals will get repeated BW throughout the lactation. However, getting a prediction that can be linked to each test-day record would be of great importance for different issues linked to the management (i.e., feeding) and selection for efficiency of US Jersey cows. Therefore, the second objective of the proposal is to adapt a recently published strategy to Jerseys in order to extend linear type scores based BW predictions throughout the whole lactation. Together with recent advances to quantify feed energy losses from fine milk composition (not part of this proposal), the joint availability of production and BW allowing the estimation of calculated net energy requirements for milk and maintenance costs will contribute to the estimation of feed energy efficiency traits for US Jersey cows.

Poock, Scott, University of Missouri, Columbia, MO , Level of BHBA, NEFA, Glucose, and Progesterone in the First 4 Weeks of Lactation and Subsequent Fertility and Production

This will be a prospective study where we will test cows once per week for the first 4 weeks of lactation for a total of 150 cows and 600 blood samples. Blood samples will be collected from the coccygeal vein (tail vein) and Body Condition Scores (BCS) will be taken during herd check or, on alternative weeks, after the morning milking. Beta Hydroxybutyric Acid (BHBA) and glucose levels will be assessed cow side, using a Precision Xtra meter and BHBA (ketone) and glucose strips. The blood will be placed on ice and returned to the lab, where it will be spun to retrieve the plasma for Non-Esterified Fatty Acid (NEFA) and Progesterone. Thus, a total of 4 blood BHBA, NEFA, Glucose, and Progesterone samples will be

recorded for all cows over the first 4 weeks of lactation. Likewise, the additional data will be recorded on each cow: Cow ID, *Calving date, *lactation #, calving ease, ultrasound/palpation for functional corpus luteum at the last collection, *DIM at each sample date, any disease incidence the first 28 DIM, any treatments given the first 28 DIM, *DIM at first breeding, *breeding dates, *sire used for breeding, *technician used for breeding, *breeding results for first service (pregnant or non-pregnant), milk production for first 28 days of lactation, and milk production for lactation (total, Energy Corrected Milk, fat, and protein % & yields).

2016

HARVATINE, Kevin J., Pennsylvania State University, University Park, Pennsylvania

Benchmarks for Rumination in Jersey Cattle

HUSON, Heather J., Cornell University, Ithaca, New York

The genetic investigation of digital cushion thickness in Jersey cattle to reduce lameness and improve animal welfare

HUTJENS, Michael F, University of Illinois, Champaign-Urbana, Urbana, Illinois

Evaluating Feeding Programs and Nutrient Levels in Top U.S. Jersey Herds

LARRMAN, Anne Hermen, University of Idaho, Moscow, Idaho

Effect of Limit-Feeding Hay on Subacute Ruminal Acidosis in Pre-Weaned Jersey Calves

NEARY, Joseph and R.R. Cockrum, Texas Tech University, Lubbock, Texas

Are Jersey Calves Susceptible to Hypoxia-induced Pulmonary Hypertension?

PARKER Gaddis, K.L., University of Florida, Gainesville, FL

Identification of single nucleotide polymorphisms associated with ketosis in Jersey cattle using producer-recorded health data

2016 Project Summaries

Harvatine, Kevin J. , Pennsylvania State University, University Park, Pennsylvania, Benchmarks for Rumination in Jersey Cattle

In an effort to meet the high energy and protein demands of lactation the modern dairy cow is fed a highly fermentable diet which increases the risk for sub-clinical rumen acidosis (aka SARA), milk fat depression, and increase incidence of numerous diseases. Sub-clinical rumen acidosis has been estimated to cost the US dairy industry between 500 million and 1 billion dollars per year and varies between farms, over time on the same farm, and within cows on each farm. Recent advances in technology to monitor rumination provide the opportunity to monitor individual cows with the goal of reducing altered rumen fermentation and associated issues. Most published work has characterized rumination in Holstein cows. Development of rumination benchmarks specific for Jersey cows will allow more precise management at the herd and cow level. We propose to 1. Characterize the mean and range of rumination in Jersey cows between farms and cows within farm and 2. Investigate the relationship between rumination and milk trans-FA, which are an indication of altered rumen fermentation and rumen acidosis, in Jersey cows.

Our goal is to increase the value of rumination observation systems rapidly being installed for reproduction and herd health protocols by providing benchmarks and metrics to predict rumen health.

This proposal addressed the AJCC Foundation priority: *Nutrition of high-producing Jerseys, particularly practical feeding methods to maximize production of valuable milk components.*

The project will collect rumination data from commercial Jersey farms with rumination observation systems and DHIA milk testing. Milk samples will be collected from a sub-set of the farms for determination of milk fatty acid profile that will be used as an indication of rumen acidosis.

Huson, Heather J., Cornell University, Ithaca, New York, The genetic investigation of digital cushion thickness in Jersey cattle to reduce lameness and improve animal welfare

Lameness or "*the clinical presentation of impaired locomotion, regardless of cause*" is one of the most costly and prevalent diseases within the dairy cattle industry today. Lameness has both economic and animal welfare implications as inflicted individuals spend excessive time lying down, consuming less food, suffer from reduced reproductive efficiency and milk production, and increased culling rates. Estimated costs for lameness range between $120-500 per case. The subtle nature of early symptoms of lameness and a cow's natural instinct to disguise discomfort makes timely diagnosis and treatment problematic. In addition, the complex nature of lameness caused by multiple diseases demonstrating pathological variation influenced by environmental and genetic factors confounds prognosis and treatment. Identifying the underlying mechanisms which influence cow susceptibility to lameness would improve overall cow health and animal welfare with better management. To this end, current research in our laboratory focuses on the shock-absorbing digital cushion (DC) of the bovine hoof, primarily composed of adipose tissue, which is directly correlated with lameness incidence and suspected as a fat reserve mobilized during early lactation and negative energy balance. Therefore, while specific hoof lesions will be assessed, this basic physiological trait which is measureable on both healthy and diseased animals, is being compared to a variety of hoof lesions as well as overall production. The identification of genetic markers associated with DC thickness provides a tool for selecting animals at reduced risk of lameness. The proposed project and requested funding will broaden the investigation of the DC thickness to the Jersey breed to ensure proposed diagnostic markers are

accurate between Holstein and Jersey breeds and detect any diagnostic markers specific to the Jersey breed. Genetic selection provides a proactive preventative approach for improved foot health.

Hutjens, Michael F, University of Illinois, Champaign-Urbana, Urbana, Illinois, Evaluating Feeding Programs and Nutrient Levels in Top U.S. Jersey Herds

A field survey will be conducted with support and assistance of the American Jersey Cattle Association. Cari Wolfe, Director of Research and Genetic Program Development, indicated the association could provide a list of the top Jersey herds in the U.S. from 2015 based on cheese yield production. An in-depth survey instrument will be developed similar to the 2010 Holstein survey of top Holstein herds in Wisconsin by Dr. Randy Shaver allowing the results to be compared. Depending on the number of corresponding herds (targeting 35 to 45 Jersey herds, the data can be summarized by herd size and region of the U.S. The questionnaire will ask for current ration(s) fed to lactating and dry cows, grouping strategies, forage storage systems, feed handling approaches, and feed bunk management application (anticipated in November, 2016). We would work directly with the dairy manager and feed company/nutritionist to get the herd nutrient profile using their computer based results. If needed, the ration (s) can be also evaluated by Spartan III, Michigan States computer software model. If needed, a phone call will be made to the dairy manager and/or nutrionist to confirm any questions or clarify points.

Laarman, Anne Hermen, University of Idaho, Moscow, Idaho, Effect of Limit-Feeding Hay on Subacute Ruminal Acidosis in Pre-Weaned Jersey Calves

Monitoring occurrences of subacute ruminal acidosis on farm remains challenging. In pre-weaned calves, monitoring the incidence of subacute ruminal acidosis and the state of rumen development are important factors in determining when a calf is ready to wean. Developing a method of monitoring the occurrence of subacute ruminal acidosis will contribute to optimizing weight gains in pre-weaned and freshly weaned Jersey calves.

Neary, Joseph and R.R. Cockrum, Texas Tech University, Lubbock, Texas, Are Jersey Calves Susceptible to Hypoxia-induced Pulmonary Hypertension?

Brisket disease, or right-sided congestive heart failure due to hypoxia-induced pulmonary hypertension, is a leading cause of calf death loss in high altitude regions. Estimates suggest that 2 to 10% of calves raised at altitudes > 7,000 ft. die from brisket disease; consequently, brisket disease is an economically relevant trait of major importance for high altitude dairy producers.

Unfortunately, studies of brisket disease have been limited to Holsteins and beef cattle; consequently, we cannot say with any certainty whether Jersey calves are also susceptible. This uncertainty is a major concern for producers looking to establish Jersey, or Jersey-influenced, dairy operations in higher altitude regions. Anecdotal reports from South America suggest that Jersey calves are susceptible to brisket disease. Experimental studies are needed to confirm or refute these reports and, if needed, identify the genetic basis for this disease.

Importantly, we already know Holsteins are highly susceptible: Brisket disease was recently reported to be the second leading cause of death loss in Holstein heifers <1.5 years of age raised at altitudes of 5,000 ft. Consequently, a niche marketing opportunity may exist for the Jersey breed: If Jerseys are found to be less susceptible to hypoxia-induced pulmonary hypertension than rival breeds, Jersey

genetics could be marketed as being more suited to high altitude dairy production.

Our goal is to determine if Jersey calves are susceptible to hypoxia-induced pulmonary hypertension following exposure to a simulated high-altitude environment. Our first objective is to monitor pulmonary arterial pressures, cardiac function, and arterial oxygenation status during exposure to a simulated altitude of 15,000 ft. Pulmonary arteries and cardiac tissue will be evaluated post-mortem for lesions consistent with pulmonary arterial hypertension and right-heart remodeling. Our second objective is to perform gene expression analyses on 3 tissues obtained post-mortem (pulmonary arterial, right and left ventricles). The results will be compared with other breeds to determine if there is a common disease pathway. The findings of this study will address concerns raised by dairy producers that Jersey calves may be susceptible to brisket disease, a leading economically relevant health trait of high altitude dairy production, and demonstrate to Jersey producers worldwide that the AJCC is committed to finding a solution.

Parker Gaddis, K.L., University of Florida, Gainesville, FL, Identification of single nucleotide polymorphisms associated with ketosis in Jersey cattle using producer-recorded health data

The overall goal of the proposed research is to use available producer-recorded ketosis data on Jersey cows to identify genetic markers associated with resistance to ketosis. Our hypothesis is that the genetic markers associated with ketosis resistance may be different in Jersey cattle as compared to Holstein or other breeds. The approach will be similar to that taken by Tiezzi et al (2015) in a genome-wide association study of mastitis in first lactation Holsteins. A single-step analysis will be performed using a threshold sire model that blends pedigree and genomic data from Jerseys. Available Jersey sire genotypes will be use. A threshold model will account for the binary nature of ketosis incidence. From this analysis, sire predicted transmitting abilities will be obtained, as well as estimates of marker effects. This will also allow calculation of estimates of variance components including heritability. From results of the genome-wide association study, putative genes will be further investigated that could be involved in ketosis resistance. Enrichment analyses will be performed using the results of the association analysis in order to identify biological pathways that are significant in ketosis resistance of Jerseys. Identification of significant markers and pathways will allow for a better understanding of the genetic control behind ketosis resistance specifically for Jerseys. Identified genomic regions could be used as predictors of ketosis resistance in Jersey cattle. This research can further progress health research by laying groundwork for future genomic selection of health traits in Jersey cattle. Improved health of Jerseys will not only improve the welfare of the animals, but also increase profitability of producers by decreasing the costs of management.

W143

A Genetic Investigation of Isle of Jersey Cattle, the Foundation of the Jersey Breed

Date: Sunday, January 11, 2015
Time: 8:20 AM
Room: San Diego

***Heather J Huson** , Cornell University, Ithaca, NY*
Tad S. Sonstegard , Animal Genomics and Improvement Laboratory, USDA-ARS, Beltsville, MD
James Godfrey , Royal Jersey Agricultural and Horticultural Society, Trinity, United Kingdom
David Hambrook , Royal Jersey Agricultural and Horticultural Society, Trinity, United Kingdom
Cari Wolfe , American Jersey Cattle Association, Reynoldsburg, OH
George R. Wiggans , Animal Genomics and Improvement Laboratory, ARS-USDA, Beltsville, MD
Harvey Blackburn , National Center for Genetic Resources Preservation, USDA, Fort Collins, CO
Curtis P. Van Tassell , USDA-ARS-AGIL, Beltsville, MD

Jersey, one of the oldest dairy breeds, was founded nearly 200 years ago on the Channel Island of Jersey. As early as 1763, legislation banned cattle importation to the island, leading to the development of the Jersey breed. Records indicate considerable cattle exportation from Jersey Island from the early 1800's through the mid-20 century with technological advances such as artificial insemination, bringing about exportation in the form of germplasm. This dynamic led to Jersey populations undergoing selection and genetic drift in the environments they had been introduced, such as the U.S., while the genetics of the foundation population was preserved on the island itself. Principle component analysis of island to non-island Jerseys using 777K SNP data, demonstrates breed homogeneity when compared with other breeds but eventual segregation of the island population when comparing Jerseys. Marker-based F calculations identified SNPs illustrating population variation among Jerseys. Overall, no significant difference in inbreeding measures was found when comparing island Jerseys with other national populations. However, different mechanisms may be driving the similarity in inbreeding coefficients between the island and U.S. Jersey populations, such as differences in population size and selection pressures. Runs of homozygosity (ROH) highlighted genome conservation among all Jersey populations with sex determination, protein methylation, and metabolic pathways targeted in a PANTHER analysis. In contrast, unique ROH were identified in the island Jerseys over multiple immune function pathways. This investigation of the genetic foundation of Jersey cattle identified both similarities among diverse populations and distinct regions of conservation in island Jerseys.