

( $P = 0.66$ ). In summary, embryonic/fetal survival was decreased following GnRH-induced but not spontaneous ovulation of small ( $\leq 11$  mm) ovulatory follicles in beef cows.

**Key Words:** Fixed-time AI, Follicle Size, Embryonic Mortality

**212 Effect of hCG administration approximately 5 d after artificial insemination on progesterone concentrations and AI conception rates in beef heifers.** R. N. Funston<sup>\*1</sup>, J. L. Olson<sup>2</sup>, R. J. Lipsey<sup>3</sup>, T. W. Geary<sup>4</sup>, and A. J. Roberts<sup>4</sup>, <sup>1</sup>University of Nebraska, Lincoln, <sup>2</sup>Montana State University, Bozeman, <sup>3</sup>American Simmental Association, Bozeman, MT, <sup>4</sup>USDA-ARS, Miles City, MT.

Objectives of this study were to determine if administration of hCG approximately 5 d after AI would increase plasma progesterone (P4) concentrations and conception rates in beef heifers. Heifers from two locations (Location 1,  $n = 347$ ; BW =  $367 \pm 1.72$  kg; Location 2,  $n = 246$ ; BW =  $408 \pm 2.35$  kg) received MGA ( $0.5\text{mg}\cdot\text{hd}^{-1}\cdot\text{d}^{-1}$ ) for 14 d and an injection of PGF (Lutalyse<sup>®</sup>; 25 mg; i.m.) 19 d later. Heifers were observed for estrus continuously during daylight from 0 to 4.5 d after PGF and inseminated by AI approximately 12 h after onset of estrus. Pregnancy status was determined by ultrasound approximately 50 d after AI. One-half of the heifers inseminated at Location 1 were randomly assigned to receive an injection of hCG (Chorulon<sup>®</sup>, 3333 IU i.m.) 8 d after PGF and a blood sample was collected from all heifers 14 d after PGF for P4 analysis. One-half of the heifers inseminated at Location 2 were administered hCG on d 9 after PGF and a blood sample was collected from all heifers 17 d after PGF. Heifers at Location 1 had a 93% synchronization rate, exhibited estrus  $2.46 \pm .03$  d after PGF and received hCG  $5.05 \pm .03$  d after AI. Heifers at Location 2 had an 85% synchronization rate, exhibited estrus  $2.69 \pm .03$  d after PGF and received hCG  $5.8 \pm .03$  d after AI. Progesterone concentrations were greater ( $P < 0.01$ ) for hCG treated heifers at both locations, 8.6 vs 4.6 ng/ml for treatment and control at Location 1 and 11.2 vs 5.6 ng/ml for treatment and control at Location 2. Conception rates (65 vs 70% for treatment and control, respectively) were not different ( $P = 0.36$ ) at Location 1. Conception rates tended ( $P = 0.11$ ) to be increased with hCG treatment at Location 2, 61 and 50% for treatment and control, respectively. In summary, hCG administration approximately 5 d after AI increased progesterone concentrations in beef heifers and tended to improve AI conception rates at one location.

**Key Words:** Heifers, Progesterone, hCG

## Production, Management, & the Environment

**214 Application of the Cornell Nutrient Management Planning System.** T. P. Tylutki<sup>\*1</sup>, D. G. Fox<sup>1</sup>, and M. McMahon<sup>2</sup>, <sup>1</sup>Cornell University, Ithaca NY USA, <sup>2</sup>McMahons EZ Acres, Homer NY USA.

The Cornell Nutrient Management Planning System (CuNMPS) is a collection of software tools that have been developed to implement integrated nutrient management planning on dairy farms. The CuNMPS consists of the Cornell Net Carbohydrate and Protein System (for evaluating rations), and Cornell CropWare (a crop nutrient management tool). A five-year project was conducted with a case-study dairy farm to determine if applying these tools have the desired impact on nutrient management. The case-study farm (625 mature Holsteins) is located over a sole-source aquifer that supplies the drinking water for approximately 55,000 people. The farm has a tillable land base of 450 ha with a mix of well drained valley land (corn:alfalfa rotation) with a high leaching potential and shallow, acidic clay hill land (continuous grass) with a high run-off potential. In 1997 (year 1), lactating cows were averaging 30.9 kg milk per day, 44% cull rate, and 42.9% of the whole herd diet being home-raised (forages only). Numerous changes occurred during the next four years driven by the adoption of quality management principles. Changes included: animal grouping strategies, feed storage, crop rotation, crop harvesting, crop type, personnel training, herd management, feeding management, and overall business management. The integration of these changes has resulted in a 38% increase in the proportion of the diet that is home grown (currently 59%), 37% reduction in the feed nitrogen purchased, 40% reduction in feed phosphorus purchases, 47% reduction in cull rate (currently below 30%), 26% increase in herd size (due primarily to reduced cull rate), 9% higher milk per cow, and

**213 Inclusion of a CIDR after initial artificial insemination concentrations of progesterone and corpus luteum volume in suckled beef cows.** R. C. Wasson<sup>\*</sup>, J. E. Larson, D. R. Brown, and G. C. Lamb, North Central Research and Outreach Center, University of Minnesota, Grand Rapids, MN 55744.

The objectives of this study were to evaluate progesterone (P4), corpus luteum (CL) and follicular response in cows after insertion of a CIDR between d 5 and 21 of the estrous cycle. Seventeen Angus cows (75 to 110 days postpartum) were estrous synchronized with the Select-Synch (a 100  $\mu\text{g}$  injection of GnRH followed by a 25 mg injection PGF<sub>2 $\alpha$</sub>  7 d later). At artificial insemination (AI) all cows were body condition scored and randomly assigned to one of four treatments: 1) untreated controls ( $n = 5$ ); 2) administration of a CIDR on days 5 to 14 after AI ( $n = 4$ ); 3) administration of a CIDR on days 14 to 21 after AI ( $n = 4$ ); and 4) administration of a CIDR on days 5 to 21 after AI (on d 14 after AI the first CIDR was removed and replaced with a new CIDR;  $n = 4$ ). On d ?9, and -2 to 26 relative to AI, blood was collected and serum harvested daily for determination of P4 concentration, plus transrectal ultrasound of the ovaries was performed to determine follicle and CL diameters. Cows were examined for pregnancy via transrectal ultrasound on d 28 and 56. One cow in each treatment was pregnant after initial AI. Six cows were observed in estrus and inseminated by AI between d 21 and 26 (3, 1, 2, 0 for treatments 1, 2, 3, and 4, respectively). On d 56, the number of pregnancies per treatment were 3, 2, 3, 1 for treatments 1, 2, 3, and 4, respectively. Between d 5 and 21 average CL volume was greater ( $P < 0.01$ ) for treatments 2 ( $3.8 \pm 0.2 \text{ cm}^3$ ), 3 ( $3.5 \pm 0.3 \text{ cm}^3$ ), and 4 ( $3.6 \pm 0.3 \text{ cm}^3$ ) than 1 ( $2.6 \pm 0.2 \text{ cm}^3$ ) and average concentrations of P4 were greater ( $P < 0.01$ ) for treatment 2 ( $3.2 \pm 0.2 \text{ ng/mL}$ ) and 4 ( $3.4 \pm 0.2 \text{ ng/mL}$ ) than 1 ( $2.6 \pm 0.2 \text{ ng/mL}$ ), whereas 3 ( $2.9 \pm 0.2 \text{ ng/mL}$ ) was intermediate. Regardless of treatment CL volume and concentrations of P4 correlated ( $r = 0.504$ ;  $P < 0.001$ ). During d 5 to 21 the average concentration of P4 was greater ( $P < 0.01$ ) in cows with a CIDR ( $3.8 \pm 0.2 \text{ ng/mL}$ ) than those without a CIDR ( $3.0 \pm 0.2 \text{ ng/mL}$ ). In addition, daily concentrations of P4 tended ( $P = 0.11$ ) to be greater in cows with a CIDR than those without. We conclude that inclusion of a CIDR during after AI increased concentrations of P4 and enhanced CL volume during diestrus. Inclusion of a CIDR did not appear inhibit embryonic survival.

**Key Words:** Beef Cows, Progesterone, Estrous synchronization

45% more milk sold per day. Additionally, purchased feed costs for the entire herd (assuming 2002 feed prices in 1997) have been reduced 48% per 45.4 kg milk. This level of impact exceeded expectations; however, it highlights the need for precision feeding, improved integration of herd, soils and crops management and intensive model training for CNCPS and CropWare, a higher farm management level, and the adoption of continuous improvement and quality management by the farm and their advisors.

**Key Words:** Nutrient management, Quality control, Models

**215 Nutrient management practices on U.S. dairy operations: Results from the NAHMS Dairy 2002 Study.** B. J. McCluskey<sup>2</sup>, J. E. Lombard<sup>\*1</sup>, and S. Ott<sup>2</sup>, <sup>1</sup>Integrated Livestock Management, Colorado State University, Fort Collins, CO, <sup>2</sup>USDA:APHIS:VS, CEAH, Center for Animal Health Monitoring, Fort Collins, CO.

Sound nutrient management practices are essential to maximize the economic benefits of manure while simultaneously reducing the risk of adverse environmental consequences. New and existing regulations have been promulgated to find the balance between normal dairy operation practices and environmental protection. The National Animal Health Monitoring Systems Dairy 2002 study surveyed dairy operations in 21 states representing 82.8% of U.S. dairy operations and 85.5% of U.S. dairy cows. One specific objective of this study was to assess nutrient management practices used on U.S. dairy operations. Approximately 55% (S.E. 2.9) of operations reported using either a gutter scraper or

mechanical alley scraper (e.g. tractor) to handle a majority of the manure on the operation. Alley flush with fresh or recycled water was used on 1.9% (S.E. 0.4) of operations. Most operations stored manure in a manure spreader (40.8% S.E. 2.1) or in an earth basin without treatment (22.5% S.E. 1.7). Just over 20% (S.E. 1.6) of operations analyzed manure for nitrogen, phosphorus or potassium. Thirty-nine percent (S.E. 2.1) of operations reported that they applied manure less than 200 feet from a body of water (lake, pond, stream or river), while 37.3% (S.E. 2.1) only applied manure 1,000 feet or more from a body of water. Individual operation nutrient management plans have become required under many state and federal regulations. However, only 30.6% (S.E. 1.8) of operations reported that a written nutrient management plan was in place on their operation. When asked how they would classify their operation under the concentrated animal feeding operation (CAFO) guidelines, 38.1% (S.E. 2.1) of respondents had never heard of CAFO, 20.5% (S.E. 1.8) were not sure how their operation would be classified, 33.3% (S.E. 2.0) believed their operation would most likely not be classified as a CAFO and 8.1% (S.E. 0.9) believed their operation would be classified as a CAFO. //

**Key Words:** Nutrient management, Manure management

**216 Culling rate and death loss associations with DHI production values.** A. J. Young<sup>1</sup>, S. C. Smith<sup>2</sup>, and S. P. Tripp<sup>\*2</sup>, <sup>1</sup>Utah State University, Logan, <sup>2</sup>DHI Computing Service, Provo, UT.

The objective of this study was to examine the relationships between culling and death losses in herds in the Western United States. The DHI Computing Service database was queried on January 30, 2003 for herds that had more than 100 total cows, had been on test for more than a year and were located in the western U.S. (Texas to the west coast). A total of 1,005 Holsteins herds were identified, and then split into groups that milked either two or three times per day (2X or 3X). There were 734, 2X-Holstein (2X-H) herds for a total of 365,823 animals with average RHA of 9818 kg, 7.00% death loss, and a 32% cull rate. There were 269, 3X-Holstein (3X-H) herds for a total of 237,976 animals with average RHA of 11,133 kg, 7.75% death loss and a 34% cull rate. There were 121 Jerseys herds with a total of 40,182 animals that had a RHA of 7110 kg, 6% death loss and a 30% cull rate (herds were not divided into 2X or 3X). Correlations between herd summary production values and culling and death loss percentage were run for each group. For 2X-H herds, the correlation of % death loss with relative value of animal culled (RV) and RHA milk was  $r = -0.234$  and  $r = -0.155$ , respectively. For the 2X-H herds, the correlation of percent culled with RHA milk and SCS was  $r = 0.065$  and  $r = 0.054$ , respectively. The 3X-H herds had similar correlations of % death loss with RV ( $r = -0.153$ ) and RHA milk ( $r = -0.218$ ). For 3X-H herds, the correlations of percent culled with RV and SCS were  $r = 0.220$  and  $r = 0.140$ , respectively. For Jersey herds the correlation of % death loss with RV was  $r = -0.325$  and with SCS was  $r = 0.226$ . In addition, the correlation of percent culled with RHA milk protein% was  $r = 0.280$  and with the milk protein to fat ratio was  $r = 0.310$ . For all groups, correlations between herd size and % death loss ranged from  $r = 0.005$  to  $0.043$ . We conclude that the percent culling and death loss are not associated with herd size, and are marginally or not at all associated with RHA, SCS or milk fat and protein percentage. The possible reasons for increased % death loss are not based on these variables.

**Key Words:** Culling, Death loss, DHI

**217 The simulated economic cost of extended calving intervals in dairy herds and comparison of reproductive management programs.** P. D. French<sup>\*1</sup> and R. L. Nebel<sup>2</sup>, <sup>1</sup>Oregon State University, Corvallis, <sup>2</sup>Virginia Tech, Blacksburg.

A computer simulation was developed to estimate the economic loss associated with extended calving intervals and to evaluate the relative cost of estrus detection and ovulation synchronization programs. Weekly production, conception, and cull events were generated for individual cows in a typical herd. Data for 10 herds of 125 cows in milk were generated over 7 years for one of 189 scenarios in a 7 by 3 by 3 by 3 factorial arrangement of treatments. Main effects were days open (85, 100, 115, 130, 145, 160, or 175), peak milk yield (36, 42 or 49 kg), break-even milk yield (14, 18, or 23 kg/d), and days in milk when open cows were designated do not breed (301, 350, or 399). Days open was increased from 85 to 175 by decreasing heat detection rate. Data were averaged

annually and analyzed by the MIXED procedure of SAS. Annual income was calculated as the difference between revenue (milk, calf, and cull) and expenses (feed, replacement heifers, interest, and other). Income increased as days open decreased, cull milk yield increased, milk yield increased, and do not breed increased. For a typical herd, the loss in income per day open for each additional day open beyond 85 days in milk was \$0.42, 0.42, 1.14, 1.98, 3.12, and 4.95 for 100, 115, 130, 145, 160, and 175 days open, respectively. Reduced income as days open increased was due primarily to reduced milk revenue and increased replacement expense. The cost of two estrus detection systems (HeatWatch<sup>®</sup> and pedometer) and two ovulation synchronization programs (ovsynch and presynch) were compared to visual estrus detection. Components included in the cost analysis were start-up and maintenance of the system. Cost was expressed as \$/pregnancy and included adjustments for additional days open beyond 85 days in milk. HeatWatch<sup>®</sup> resulted in the lowest cost per pregnancy followed by pedometer, presynch, ovsynch, and visual detection. These results indicate that losses from extended calving intervals have been previously underestimated.

**Key Words:** Days open, Economic efficiency, Estrus detection

**218 Herd management and cow productivity information from an autoregressive test-day model applied in southeastern Sicily.** G. Azzaro<sup>1</sup>, S. Ventura<sup>1</sup>, J. Carvalheira<sup>2</sup>, M. Caccamo<sup>1</sup>, G. Licitra<sup>1,3</sup>, E. Raffrenato<sup>\*1,4</sup>, and R. W. Blake<sup>4</sup>, <sup>1</sup>CoRFiLaC, Regione Siciliana, 97100 Ragusa, Italy, <sup>2</sup>Universidade do Porto, Vairao, Portugal, <sup>3</sup>D.A.C.P.A., Universit di Catania, Italy, <sup>4</sup>Department of Animal Science, Cornell University, Ithaca, 14853 NY, USA.

Test-day (TD) models can account for environmental effects associated with each record, describe the trajectory of lactation for groups of animals, and provide reliable estimates of management factors affecting herd performance. An autoregressive multiple-lactation TD animal model with DFREML methodology was used to obtain estimates of genetic parameters for TD records, cow productivity and management information of Holstein, Brown Swiss and Modicana cows (a local breed) in southeastern Sicily. Records from the first three lactations (1994-2000) were used to estimate the genetic (co)variance components and parameters. The edited data were 214,650 (15,161), 44,768 (3,049) and 8,669 (660) records (cows) of milk, fat and protein for Friesian, Brown Swiss and Modicana breeds. Parameter solutions were applied using the model to routinely obtain monthly estimates of management factors for the 12 months preceding the current TD for all farms, including prediction of missing and future TD yields, cumulative 305-d lactations, management and lactation curves for each trait and breeds. These results are being used to develop management schemes. Management curves for milk and components reveal within-year variation in average daily yields and seasonal effects on quality, availability and cost of feed, thus facilitating evaluation of the feeding and management programs on a monthly basis. Comparison of lactation curves may also help identify limitations in nutrition and management. This monthly information, which is available online, is now a key extension tool in assisting farmer decision making.

**Key Words:** Test-day model, Management

**219 Seasonality of productive life of dairy cows in Florida and Georgia.** B. L. Butler<sup>\*</sup> and A. de Vries, Department of Animal Sciences, University of Florida.

Seasonality of cow performance is a concern to dairy producers in the Southeast. In the hot summer months cows produce less milk, are more difficult to get pregnant, and may be more at risk of being culled. This seasonality may have major implications for optimal management decisions concerning reproduction, milk production, or the time of purchase of new animals. Our objectives were to quantify the effects of season of first calving on productive life, lifetime milk production, and first lactation cull rate of dairy cows in Florida and Georgia. Productive life is defined as the time between first calving and culling. Lifetime milk is defined as the total amount of milk produced between first calving and culling. First lactation cull rate is the fraction of cows that do not calve for a second time. DHIA lactation records were obtained and limited to cows culled primarily in 2000 (n=52,620). Monthly average productive life of cows calved for the first time in January through December were respectively 971, 971, 972, 936, 960, 845, 808, 862, 880, 928, 950, and 970 days. Corresponding lifetime milk productions were respectively 21688, 21558, 21641, 20339, 21249, 18549, 17802, 19168, 19621, 20773, 21312,

and 21646 kg. First lactation cull rates were respectively 27.1%, 28.7%, 28.2%, 29.1%, 27.8%, 37.4%, 39.7%, 33.3%, 33.4%, 29.1%, 27.8%, and 27.7%. The effect of month of first calving was not significant for the monthly cull rate of older lactations. We concluded that the month of first calving has significant effects on productive life, lifetime milk production, and first lactation cull rate. Cows calving for the first time in July had the shortest productive life, lowest lifetime milk production, and highest first lactation cull rate. The range between July and the most favorable month were 164 days of productive life, 3886 kg milk, and 12.4% first lactation cull rate. These results will likely have implications for optimal scheduling of reproduction, milk production, and cow replacement in Florida and Georgia.

**Key Words:** Productive Life, Dairy, Seasonality

**220 Association between production, feed and weather on a commercial dairy - a case study.** A. J. Young\*<sup>1</sup> and S. P. Tripp<sup>2</sup>, <sup>1</sup>Utah State University, Logan, <sup>2</sup>DHI Computing Service, Provo, Utah.

The objective of this study was to determine the associations of production, DMI, weather and ration composition with daily income on a commercial dairy. Bulk tank milk yield and components, number of milk cows at DHI test, total DM intakes from the EZ-Feed<sup>®</sup> feeding program, ration composition as formulated by the nutritionist and income based either on component prices from Federal Milk Marketing Order 135 or weekly 40#-block cheese prices from the Chicago Mercantile Exchange were used to compute daily milk and DMI per cow, value of product and income over feed costs (IOFC) for a commercial dairy. Daily temperature and humidity were collected and used to compute a temperature heat index (THI). The study period was from 8/20/01 to 1/13/03, and the mean milk/cow per day for the period was 32.9 kg on an average of 1751 milking cows. Mean milk fat and protein are 3.53% and 3.03%, respectively. The correlation between daily milk/DMI per cow and IOFC based on the price for cheese (Ch\$) or price of fat and protein (FP\$) was  $r = 0.448$  and  $0.371$ , respectively. The correlation between Ch\$ and FP\$ was  $r = 0.911$ . Value of daily product based on FP\$/cow was correlated with ration rumen undegradable protein (RUP) ( $r = 0.578$ ) and NDF ( $r = 0.501$ ). Correlations between daily DMI/cow as predicted by the ration formulation and daily DMI/cow as fed was  $r = 0.033$ . Ration cost/day was correlated with ration RUP, soluble protein and ME ( $r = 0.474$ ,  $r = -0.492$  and  $0.413$ , respectively). Milk/cow, ration ME, ration soluble protein, ration DM%, ration carbohydrate B1 fraction and ration cost/day were correlated with maximum and minimum THI at  $r = 0.487$  and  $0.454$ ,  $r = -0.538$  and  $0.555$ ,  $r = 0.552$  and  $0.551$ ,  $r = -0.703$  and  $0.680$ ,  $r = -0.488$  and  $0.481$ ,  $r = -0.478$  and  $0.492$ , respectively. We conclude that evaluation of management changes on a dairy needs to consider not only production, but also product income, ration composition, DMI and weather in order to separate the effects of environment from management.

**Key Words:** Daily milk income, Feed costs, THI

**221 Effects of prepartum exercise on metabolism, milk yield, and health disorders of dairy cows.** J. A. Davidson\* and D. K. Beede, Michigan State University, East Lansing, MI.

Objective was to determine effects of prepartum exercise of Holstein dairy cows on blood and liver metabolites, DMI, milk yield, and health disorders. Non-lactating, multiparous pregnant cows ( $n = 26$ ) were blocked by parity and expected calving date and assigned randomly to treatments: no exercise or exercise (walking [3.25 km/h] every other day for 1.25 h from d 70 to 40 before expected calving date, and then 1.5 h to day of calving). Plasma lactate, non-esterified fatty acids, beta-hydroxybutyrate, and glucagon concentrations before parturition were not affected by exercise treatments. Prepartum venous plasma concentrations of glucose and insulin were greater as parturition neared for non-exercised compared with exercised cows ( $P < 0.05$ ); concentrations after parturition were similar. Prepartum liver glycogen and triglyceride concentrations, BW, and DM and water intakes were not different among treatments. Postpartum liver glycogen concentrations tended to be lower for exercised compared with non-exercised cows (14.7 vs. 23.2 mg/g of wet tissue,  $P = 0.09$ ), suggesting increased glycogenolysis. Postpartum liver triglyceride concentrations were similar. During the first 28 d of lactation, BW changes, DMI, milk yields, and milk component yields were not affected by prepartum exercise treatment. Three of 13

exercised cows had one or more peripartum health disorder, whereas 8 of the 13 non-exercised cows had one or more disorder (Type I error,  $P = 0.05$ ; Type II error,  $P = 0.48$ ). Prepartum exercise of dairy cows reduced the incidence of health disorders, but did not affect lactation performance during the first month.

**Key Words:** Dairy cows, Metabolism, Exercise

**222 Using activity and milk yield as predictors of fresh cow disorders.** J. L. Edwards and P. R. Tozer\*, The Pennsylvania State University, State College, PA.

The objective of this study was to determine if daily walking activity along with daily milk yield could be used as predictors of metabolic and digestive disorders early in lactation. The data, collected from 1996 through 1999, were from 1445 dairy cows in three Florida herds. Activity and milk yield were collected from the Special Agricultural Equipment (S.A.E.) Afikim<sup>®</sup> computerized dairy management system. Mixed models analysis was undertaken on cows prior to their first detected heat identified by the difference in activity. A healthy cow was one that did not have an occurrence of a metabolic or digestive disorder during a full lactation. A sick cow had an occurrence of these disorders at any time during the current lactation. Metabolic disorders included Bovine Viral Diarrhea, ketosis, milk fever, and retained placenta. Digestive disorders included displaced abomasum, indigestion, reduced feed intake, traumatic gastritis, acidosis, and bloat. Individual diseases including ketosis, left displaced abomasum, retained placenta, and digestive disorders were analyzed to find when activity and milk yield decreased before these specific disorders were clinically diagnosed. The beginning day of decline, relative to the day the illness was diagnosed, for activity and milk yield is shown in the table below for cows clinically diagnosed with ketosis, left displaced abomasum, retained placenta, and digestive disorders. Daily milk yield of sick cows was approximately 15 kg/d less than the production of healthy cows. Considering these results, cows diagnosed with ketosis, left displaced abomasum, and general digestive disorders could be detected at least five to six days earlier based on changes in daily activity and milk yield.

Disease	Beginning day of decline Activity	Milk yield
Ketosis	-8	-6
Left displaced abomasum	-9	-7
Retained placenta	-1	-1
Digestive disorders	-8	-5

**Key Words:** Walking activity, Fresh cow disorder, Pedometer

**223 Monitoring electrical power quality effects on milk production of dairy herds.** D. Hillman\*<sup>1</sup>, D. Stetzer<sup>2</sup>, M. Graham<sup>3</sup>, C. L. Goeke<sup>4</sup>, K. Mathson<sup>2</sup>, H. H. VanHorn<sup>5</sup>, and C. J. Wilcox<sup>5</sup>, <sup>1</sup>Michigan State University, East Lansing, MI, <sup>2</sup>Stetzer Electric, Inc., Blair, WI, <sup>3</sup>University of California, Berkeley, CA, <sup>4</sup>Goeke Enterprises, Mason, MI, <sup>5</sup>University of Florida, Gainesville, FL.

Public Utility Commissions (PUC) in several states adopted 0.5 volt or 1.0 milliampere as the actionable limit for utilities to respond to complaints of uncontrolled voltage. Complaints that animal behavior and milk production were affected by electrical shocks below the adopted standards were investigated on 12 farms in Wisconsin, Michigan, and Minnesota. Milk production per cow was from daily tank-weight pickup and number of cows milked. Number of transient events, transients, voltage (peak to peak), waveform phase angle degree, sags and sag-Vrms were measured from event recorders plugged into milk house wall outlets. Data from 1705 cows and 939 data points were analyzed by multi-herd least-squares multiple regression and SAS-ANOVA statistical programs. In five herds for 517 days, milk/cow/day decreased -0.0287 kg/transient event ( $P < 0.02$ ) as transient events increased from 0 to 99/day. Effects on milk/cow/day from event recorder measurements were significant for eight independent electrical variables. Step-potential voltage and frequency of earth currents were measured by oscilloscope from metal plates grouted into the floor of milking stalls. Milk decreased as number of 3rd, 5th, 7th, 21st, 28th, 42nd, and the sum of triplen harmonics (3rd, 9th, 15th, 21st, 27th, 33rd, and 39th) increased/day ( $P < 0.003$ ). Event recorder transient events were positively correlated with oscilloscope average Vp event readings, with number of measures over 90 Hz, and number of 4th, 7th, 10th, and 42nd harmonics per day.

Steps/minute of a dancing cow, counted from videotape, were correlated with non-sinusoidal 8.1 to 14.6 mVp impulses recorded by oscilloscope from EKG patches on legs. PUC standards and use of shunt resistors in test circuits underestimate effects of non-sinusoidal, higher frequency voltage/current on rural power lines.

**Key Words:** Transients, Harmonics, Power quality

## 224 Adoption of human resource management practices in dairy businesses. R. E. Stup\*, L. A. Holden, and J. Hyde, Penn State University.

As dairy farm organizations increasingly rely on non-family employees, the need for effective human resource management (HRM) practices becomes more pressing. The goal of this research project was to gather information about human resource management practices used in progressive Pennsylvania dairy businesses. We collected a detailed set of data from 62 dairy farm managers who were nominated by extension agents, business consultants, or other industry professionals based on their knowledge of the manager. Managers who were known by the professionals to be progressive and profitable were surveyed. The survey gathered information about the managers and the HRM practices they use. Information was gathered through personal visits by project researchers. Job descriptions are a fundamental HRM tool. They improve communication between the employee and employer about specific job qualifications and responsibilities. In this sample, 22% of managers indicated that all of their full-time employees had job descriptions, 25% indicated that some of their full time employees had job descriptions, and 52% indicated that none of their full-time employees had job descriptions. The percent of managers who used job descriptions for all part-time employees was 23%, for some was 20%, and for none of their part-time employees was 57%. Standard operating procedures (SOPs) are used to reduce variation in production processes that is introduced by employees carrying out tasks differently from one person to another and from one time to the next. In this study, 47% of managers indicated that they were using SOPs to manage at least one of their production processes. Providing performance feedback to employees is a basic responsibility for any human resource manager. Thirty-one percent of managers in this sample reported that they provided frequent feedback to their employees, 67% reported that they provided feedback only when an unusual situation (good or bad) arose, and 2% reported that they provided no feedback to employees about their performance. Educational opportunities in HRM should be expanded to increase adoption of important practices.

**Key Words:** Human resource management, Labor, Standard operating procedures

## 225 *Mycoplasma* in bulk tank milk on U.S. dairy operations. B. J. McCluskey<sup>2</sup>, J. E. Lombard<sup>\*1</sup>, and H. L. Hirst<sup>1</sup>, <sup>1</sup>Integrated Livestock Management - Colorado State University, <sup>2</sup>USDA:APHIS:VS, CEAH, Center for Animal Health Monitoring.

The National Animal Health Monitoring System's Dairy 2002 study surveyed dairy operations in 21 states representing 82.8% of U.S. dairy operations and 85.5% of U.S. dairy cows. Dairy 2002 data showed that 7.9% of participating dairies tested positive for *Mycoplasma spp.* when a single bulk tank sample was cultured. Western region states had a greater percentage of operations with positive cultures than operations in the Midwest, Northeast and Southeast regions. Large herds (500 head or more) were more likely to have positive cultures (21.7% S.E. 3.7) than medium herds (100 to 499 head) or small herds (less than 100 head) at 3.9% (S.E. 1.2) and 2.1% (S.E. 0.7), respectively. Variables potentially associated with positive bulk tank results were screened by chi square testing. Significant variables ( $p < 0.2$ ) were entered into a logistic regression model. Types of variables tested in the model included; the number of new additions (dairy heifers, lactating cows, dry cows) to the herd as a percentage of the total herd; individual cow somatic cell count and bulk tank somatic cell count testing requirements prior to introducing new cattle to the operation; individual cow milk culture and bulk tank milk culture requirements prior to introducing new cattle to the operation; type of housing; milking procedures employed on the operation; herdsize and the region where the operation was located. The final model included herdsize, the number of lactating cows brought on to the operation as a percentage of the total herd, and the outside area

that dry cows have access to in the summer. Region was forced into the model as a potential confounding variable. Small and medium sized operations were 25 and 10 times less likely to have a positive bulk tank sample than large herds, respectively. Operations that added a number of lactating cows in 2001 greater than or equal to 10% of the total herd were 2 times as likely to have a positive *Mycoplasma* bulk tank sample.

**Key Words:** Mycoplasma, Milk, Survey

## 226 Sample collection depth and physical separation by screening affect aflatoxin concentration in contaminated corn. A. F. Harper<sup>1</sup>, J. B. Meldrum<sup>2</sup>, J. Zhao<sup>\*1</sup>, and M. J. Estienne<sup>1</sup>, <sup>1</sup>Virginia Polytechnic Institute and State University, Blacksburg, <sup>2</sup>VA-MD Regional College of Veterinary Medicine, Blacksburg.

We conducted a sampling study within a bin of corn grain (73,600 kg) previously determined to be contaminated with aflatoxin (57 ppb). The objective was to determine if depth within the bin and mechanical screening of the sample would have effects on aflatoxin concentration. Samples were collected with a probe at depths of 1, 3 and 5 m within the bin ( $n = 4/\text{depth}$ ). The samples were mechanically shaken over a 6.75 mm screen to separate fine material (fines) from intact kernels. Fines made up 7.9 to 9.2 % of the weight of each sample. Dry matter, bulk density and aflatoxin concentration as detected by ELISA were determined for the separate fractions. Samples taken at 1 m depth had slightly lower dry matter than those taken at 3 and 5 m depths (87.7 % vs. 88.7 and 88.60  $\pm$  0.2 %,  $P < 0.01$ ). Whole kernels also had slightly less dry matter than fines (87.8 % vs. 88.8  $\pm$  0.2 %,  $P < 0.001$ ). Samples had greater bulk density with increasing sample depth (688.9, 702.3, and 717.5  $\pm$  3.9 g/L for 1, 3 and 5 m depth,  $P < 0.03$ ); and, whole kernels had greater bulk density than fines (755.8 vs. 649.9  $\pm$  3.2 g/L,  $P < 0.001$ ). The aflatoxin concentration in the whole kernel fractions was 86 to 89 % lower than aflatoxin concentration in the fines ( $P < 0.001$ ). Samples taken at 1 m depth contained greater aflatoxin concentration than those taken at 3 and 5 m ( $P < 0.001$ ). The sampling depth by sample fraction interaction was significant ( $P < 0.001$ ). In the whole kernel fractions, mean aflatoxin concentrations were 31, 9 and 13  $\pm$  13 ppb for depths of 1, 3 and 5 m, respectively and not different ( $P > 0.25$ ). In the fines fraction, mean aflatoxin concentrations were 235, 82 and 96  $\pm$  13 ppb for depths of 1, 3 and 5 m, respectively. Aflatoxin concentration in fines from the 1 m sampling depth was greater than in fines from 3 and 5 m depths ( $P < 0.001$ ). These data illustrate the potential difference in aflatoxin concentration of corn at different locations within a bin. Under the conditions of this study, grain screening to remove fines would be effective in reducing aflatoxin to levels that pose little risk for swine and poultry feeding (aflatoxin  $< 20$  ppb).

**Key Words:** Aflatoxin, Sampling, Screening

## 227 Investigating effects of ambient temperature and day length on milk production of first lactation Iranian Holstein heifers. A. Naserian<sup>1</sup>, B. Sarem<sup>1</sup>, and A. Alizadeh<sup>\*2</sup>, <sup>1</sup>Ferdowsi University of Mashhad, Khorasan, Iran, <sup>2</sup>Tarbiat Modarres University, Tehran, Iran.

Heat stress is well known to depress milk yield (MY) and appetite in dairy cows. Cows in early lactation are sensitive to heat stress, and respond to heat stress by reducing milk production. The aim of this study was to investigate effects of day length (DL) and ambient temperature (AT) on milk production of first lactation Holstein heifers. This experiment was conducted during 1997-2002 at the Ferdowsi University of Mashhad dairy farm. Nutrient requirements of different groups of animals were supplied according to NRC (1989). The size of herd is one hundred cows milked daily and produced around 2.5-ton milk. Milk production data were recorded monthly and Khorasan State Climatologic Station prepared temperature and day length data. Data were analyzed using General Linear Models procedures of SAS v6.12 to evaluate differences among experimental groups. The design was completely randomized (unequal replicates). Means were compared with Duncan test. Data in this experiment showed that DL and AT had significant effects on milk production in the second and ninth months ( $P \leq 0.03$  and 0.01 respectively). To optimize MY, data indicate that the second month of milk production should be April, whereas November is the worst month for peak milk production. Based on these data we suggest that September is the best month for the ninth month of lactation and the worst

is March. To maximize MY under Iranian climatic and management conditions, calving should be synchronized to occur in February to have the second month of lactation at April.

**Key Words:** Ambient temperature, Day length, Milk production

## Ruminant Nutrition: Grazing - rumen metabolism - protein

**228 Effect of corn silage and grazing strategy on milk production and composition of grazing dairy cows.** P. Chilbroste\*, F. Elizondo, and D. A. Mattiauda, *Facultad de Agronomia. Est. Exp. M. A. Cassinoni.*

An experiment was completed to evaluate effects of corn silage allocation and within day grazing strategy on milk production (MP), milk composition, and body condition score (BCS) of early lactation grazing dairy cows (35±15 d in milk). A daily strip of pasture (1536±289 kg DM/ha), with an allowance of 15 kg DM/cow, was available to each treatment group between 9:00 and 15:00 h. Additionally, cows received 2.7 kg of concentrate at each milking (4:30 h and 15:30 h). Corn silage (16 kg/d/cow; fresh basis) was offered at 17:00 h (T1), at 8:00 h (T2) or in two equal meals at 17:00 and 8:00 h (T3). Thirty six cows were grouped by parity, MP and live weight, and randomly assigned to treatments. MP was recorded daily and milk composition was determined on four consecutive milkings each week (W). BCS was recorded at the beginning, middle and end of the study. Data was analyzed with repeated measures using the Proc Mixed procedure of SAS 8.1. Treatment, W and T\*W effects were tested using a covariance structure. MP (25.4±0.94, 24.9±0.91 and 25.8±0.89 L/d for T1, T2 and T3, respectively), did not differ among treatments, but increased with time (P<0.01). There was no T\*W interaction. Milk protein percent did not differ among treatments (2.98±0.05, 2.94±0.05 and 2.92±0.04 for T1, T2 and T3, respectively), although a T\*W interaction (P<0.01) occurred. T2 cows lost BC at a higher rate than T1 (-0.389 vs. -0.167 units/wk) in the first half of the study but recovered BCS faster in the second half (0.057 vs 0.135 units/W, for T2 and T1 respectively). Corn silage allocation and grazing session strategy during the day did not effect MP and composition, although it modified BCS changes which could affect reproductive performance and energy partition during the lactation.

**Key Words:** Grazing, Feeding strategy

**229 Effect of corn silage and grazing strategy on rumen fermentation patterns of dairy cows.** P. Chilbroste\*<sup>1</sup>, C. Baccetta<sup>1</sup>, S. Etchegaray<sup>1</sup>, I. Ferreira<sup>1</sup>, C. Lockhart<sup>1</sup>, L. Posse<sup>1</sup>, F. Elizondo<sup>1</sup>, and D. A. Mattiauda<sup>1</sup>, *Facultad de Agronomia. Est. Exp. M. A. Cassinoni.*

An experiment was completed to evaluate effects of within day corn silage feeding times and grazing strategy on rumen pH and ammonia concentrations of early lactation grazing dairy cows (3515 d). A daily strip of pasture (1536289 kg DM/ha; with an allowance of 15 kg DM/cow was provided to each treatment group between 9:00 and 15:00 h. Cows also received 2.7 kg of concentrate at each milking (4:30 and 15:30 h). Corn silage (16 kg/d/cow, fresh basis) was offered at 17:00 h (T1), at 8:00 h (T2) or equally distributed at 17:00 h and 8:00 h (T3). The 36 cows were grouped by parity, milk production and live weight, and randomly assigned to treatments. Two rumen fistulated dairy cows, within each treatment, were used for rumen fluid collection. Data was analyzed as repeated measures using the Proc Mixed procedure of SAS 8.1. Treatment, week, hour of the day and the interactions were tested using a covariance structure. Rumen samples were collected at the start, middle and end of the experiment at 0, 1.5, 3.5, 5, 8.5, 10, 14 and 22 h from the beginning of the grazing session. pH was determined immediately and ammonia N was determined in samples preserved with sulfuric acid and frozen at -15C. pH declined (P<.05) as the grazing session progressed, and T1 cows had the lowest (P<.05) value 8 h from t=0. Ammonia concentrations increased (P<.05) as the grazing session progressed with T1 cows having higher concentrations than T2 and T3 cows in earlier samplings. After termination of the grazing session (i.e. at t=6) ammonia N concentrations declined linearly in cows on all treatments. Differences among treatments are in the Table. Within day corn silage feeding times and grazing strategy both effected some aspect of rumen pH and ammonia N values, which could suppress pasture dry matter intake and rumen fiber digestion.

pH	Difference	Probability
T1 - T2	-0.282	≤0.01
T1 - T3	-0.382	≤0.05
T2 - T3	-0.100	NS

  

Ammonia N	Difference	Probability
T1 - T2	63.78	≤0.1
T1 - T3	74.97	≤0.05
T2 - T3	11.19	NS

NS = non significant; Ammonia concentration = parts per million

**Key Words:** Grazing strategy, Grazing, Corn silage

**230 Computer modeling of a dairy systems trial comparing Holstein-Friesians fed either pasture or TMR.** P. C. Beukes, B. S. Thorrold, E. S. Kolver, M. E. Wastney, K. P. Bright, J.A.S. Lancaster, C.A.J. Palmer, and C. C. Palliser\*, *Dexcel Ltd., Hamilton, New Zealand.*

A computer model of a whole farm system (known as the Whole Farm Model or WFM) was used to simulate a trial where Holstein-Friesian dairy cows were fed either grass or a Total Mixed Ration (TMR). The genetics were either New Zealand (NZ) or Overseas (OS) and the groups had comparable Breeding Worths. The aim was to determine the accuracy of the WFM in predicting cow production on a high protein versus high energy feed, i.e., pasture (the main feed used in New Zealand) or TMR. The TMR did not include grass and represented the diet upon which the OS genetics had been selected to produce overseas. The WFM is a dynamic model which consists of a framework to which are attached mechanistic submodels for cow metabolism (the Molly model) and pasture growth. Characteristics (initial and dry-off liveweight and milk potential) of a representative cow from each year of the trial were entered into the WFM together with the observed climate data and management so that the cows were fed ad lib pasture or TMR as in the trial. Predicted values for milk yield (kg/cow/year), milksolids production (kg/cow/year), milk fat %, milk protein %, liveweight change during lactation (kg) and dry-off liveweight (kg) were compared for the grass versus the TMR diet. The differences were significant (P < 0.001) for milk protein % (mean for grass = 3.66 %, standard error (SE) 0.02; mean for TMR = 3.39 %, SE 0.01), liveweight change during lactation (mean for grass = -12 kg, SE 28; mean for TMR = 139 kg, SE 12), and dry-off liveweight (mean for grass = 491 kg, SE 11; mean for TMR = 668 kg, SE 21). These model results agree with those from the trial. Although the trends were expected, given the higher energy content of TMR and the higher protein content of pasture, the values indicate the potential production of both NZ and OS genetics when fed well. It was concluded that the WFM model correctly predicts milk production, milk composition and body weight change in cows fed diets of different composition.

**Key Words:** Dairy cow, Model, Diet

**231 Effect of grazing systems on chewing activity, ruminal pH fluctuations and pH of milk, blood and urine of dairy cows.** C. Graf<sup>1</sup>, M. Kreuzer<sup>2</sup>, and F. Dohme\*<sup>1</sup>, <sup>1</sup>Swiss Federal Research Station for Animal Production, Posieux, Switzerland, <sup>2</sup>Swiss Federal Institute of Technology, Zurich, Switzerland.

Grass in its young vegetative stage is rich in rapidly-fermentable carbohydrates and poor in physical structure and therefore could cause low ruminal pH and reduced chewing activity in dairy cows on pasture. The effects of full-time grazing (G) versus part-time grazing with nightly supply of 5.5 kg DM either as hay (H) or corn silage (C) on chewing activity and pH in various body fluids and excretion products were studied in six rumen-fistulated Brown Swiss cows. A replicated 3 x 3 Latin square design was applied. Each experimental period lasted 28 d with sampling taking place from d 21 to 28. Grass intake was quantified by the double