Production, Management and the Environment: Health and Reproduction

309   Clinical and subclinical diseases predisposing to Johne's disease.
E. Raizman*[1], S. Wells[1], S. Godden[1], M. Oakes[2], and J. Fetrwo[1], [1]*University of Minnesota*, *St Paul*, [2]*Univeristy of Minesota*, *Minneapolis*.

The objectives of this study were to: 1) assess the association between clinical or subclinical diseases and risk for subsequent occurrence of clinical Johne's disease (JD), and 2) to determine the association between clinical or subclinical diseases on risk of onset of fecal shedding after 305 days in milk (DIM). A total of 1,297 cows from two Minnesota dairies were enrolled in the study after fecal samples were obtained during the closeup period. A second fecal sample was obtained from cows after at least 305 DIM or at time of leaving the herd (sold/dead). Between 3-21 DIM, blood samples were obtained for serum Betahydroxybutyrate (BHB) and serum total protein testing. Body condition score (BCS) was evaluated during the closeup period, between 3-21 DIM, and at end of lactation. The occurrence of clinical disease events (milk fever, retained placenta, metritis, ketosis, displacement abomasum, lameness, mastitis, and JD clinical signs) was recorded. Average DIM when cows with JD clinical signs (JDCS) were culled (n=66) was 209. In the multivariable analysis, JDCS was associated with pneumonia (OR=2.6 95%CI= 1.2-6.0) and level of fecal shedding (light: OR=13.0 CI=5.3-30.0; moderate: OR= 33.0 CI=13.0-85.0; heavy: OR=63.0 CI=25.0-162.0). In the multivariable analysis onset of fecal shedding was associated only with pneumonia (OR=2.2 CI=1.1-4.2). The results provide insights into the possible role of other diseases on JDCS and fecal shedding, which may enable us to better manage the disease early in the lactation.

Key Words: Johne's Disease, Fecal Shedding

310   Evaluation of environmental sampling to determine distribution and herd infection status for *Mycobacterium avium* subspecies *paratuberculosis*. J. Lombard*[1], R. Smith[2], B. Wagner[1], and B. McCluskey[1], [1]*USDA:APHIS:VS; Centers for Epidemiology and Animal Health*, *Fort Collins, CO*, [2]*Cornell University*, *Ithaca, NY*.

The National Animal Health Monitoring System Dairy 2002 surveyed dairy operations in 21 states representing 82.8% of U.S. dairy operations and 85.5% of U.S. dairy cows. One component of the study involved collection and culture of environmental samples for MAP from areas on the farm where manure from a majority of cows accumulated. Operations were selected based on perceived risk factors for *Mycobacterium avium* subspecies *paratuberculosis* (MAP) infection identified in an earlier questionnaire. Individual animal and environmental samples were collected and used to determine the efficiency of environmental sampling to determine herd infection status. Individual animal serum and fecal samples were used to classify herds as infected or not infected based on the presence of one test positive animal in the herd. Animals in lactation 2 and greater were selected for MAP testing. A total of 483 environmental samples were collected and 216 (44.7%) were culture positive for MAP. The highest percentage of positive environmental samples were collected from parlor exits (52.3%), floor of holding pens (49.1%), common alleyways (48.0%), lagoons (47.4%) and manure spreaders (42.3%). Of the 98 operations tested with environmental sample culture, 97 had individual serum ELISA and 60 had individual fecal culture. Of the 50 herds classified as infected by fecal culture, 38 (76.0%) were identified by environmental culture. Two of the 10 operations classified as not infected based on individual animal fecal culture were environmental culture positive. Of the 80 operations classified as infected based on serum ELISA positive test results, 61 (76.3%) were identified as environmental positive. Environmental sample culturing is more cost effective than individual animal sampling and identified more than 75% of infected operations.

Key Words: *Mycobacterium avium* Subspecies *paratuberculosis*, Environmental Sampling

311   Evaluation of fecal culture pooling methods for detection of *Mycobacterium avium* subspecies *paratuberculosis* in a beef herd. S. Jensen*[1,2], J. Lombard[1,2], and F. Garry[1], [1]*Colorado State University*, *Fort Collins*, [2]*USDA:APHIS:VS; Centers for Epidemiology and Animal Health*, *Fort Collins, CO*.

Given the increased cost of whole herd fecal culture for the detection of *Mycobacterium avium* subspecies *paratuberculosis* (MAP) infection, studies evaluating fecal pooling in dairy cattle have been conducted. This beef cattle study evaluated individual fecal samples, strategically pooled samples, and collection order pooled samples in detecting infected animals. Individual fecal samples were collected from 174 beef cattle and subsequently divided into three aliquots for individual animal testing, strategic pooling and ordered pooling. Each sample pool included 4-5 individual samples and all testing was performed concurrently. Individuals were selected for a strategic pool based on their ranked age whereas order pooled samples were based on order of collection. Nineteen of the 174 individual samples, 6 of the 35 strategic pools, and 2 of the 35 ordered pools were culture positive. Four of the six strategic pools and one of the two ordered pools that were culture positive contained at least one of the 19 individual samples found to be culture positive. Both individuals classified as heavy shedders were detected by strategic pooling, while only one heavy shedder was detected by ordered pooling. Of the positive pools, two strategic pools and one ordered pool contained no samples found to be positive upon individual culture. One sample within each pooling method was found to contain two culture positive individuals. The results of this preliminary beef study suggest that bacteriologic culture of strategically pooled samples may provide a more reliable method for detection of MAP infected animals as compared to ordered pooling. However, pooling of samples from beef herds where the majority of infected animals are moderate to low shedders may not be a sensitive enough method because it significantly reduces the ability to detect MAP infection compared to individual fecal culture.

Key Words: *Mycobacterium avium* Subspecies *paratuberculosis*, Fecal Pooling, Beef

312   Effects of photoperiod on immune function in piglets at three different weaning ages. S. R. Niekamp*, M. A. Sutherland, G. E. Dahl, and J. L. Salak-Johnson, *University of Illinois*, *Urbana*.

Photoperiod manipulation provides a non-invasive, easily implemented, effective, method to alter immune status while enhancing production efficiency. The objective of this study was to evaluate the impact of weaning age and photoperiod manipulation on piglet immune responses and BW throughout the nursery phase. Piglets (n=68) used were obtained from sows subjected to a short day (SD; 8L:16D) photoperiod from d 90 of gestation until weaning. Piglets were weaned at 14, 21, or 28 d of age and kept on either a SD or a long day (LD; 16L:8D) until 10 wk of age. Piglet BW and blood samples were collected at weaning and again at 4, 6, 8, and 10 wk of age. Cortisol (CORT), total white blood cell counts (WBC), lymphocyte (Lymph) and neutrophil (Neut) counts, lymphocyte proliferation (LPA), natural killer cell cytotoxicity (NK), and neutrophil chemotaxis (CHTX) and phagocytosis (PHAG) were all measured. Age of weaning impacted various immune measures. Pigs weaned at 28 d had lower Neut counts (P < 0.001), PHAG (P < 0.001), and LPA response (P < 0.05) at weaning compared to those weaned at 14 and 21 d. Pigs weaned at 21 d had lower (P = 0.075) Lymph counts relative to 14 and 28 d. Pigs weaned at 14 d had lower NK (P < 0.01) relative to 21 and 28 d. Photoperiod also influenced BW and immune status throughout the nursery phase. Generally, pigs kept on LD and weaned at 28 d were heaviest (P < 0.001). At 4 wk, Neut counts were highest (P = 0.029) in those weaned at 21 d and kept on SD. At 6 wk of age, NK was higher (P = 0.002) among those weaned at 14 and 21 d kept on LD than those weaned at 28 d. Piglets on LD and weaned at 28 d had lower PHAG (P =

0.005) at 6 wk of age but higher at 8 wk than those weaned at 14 and 21 d. These data support the concept that photoperiod may influence immune responses in piglets and may imply an inverse relationship between growth and immune status.

Key Words: Photoperiod, Weaning, Nursery

313   Productive performance of primiparous sows progeny in nursery period. C. Piñeiro*[1], J. Morales[1], M. Piñeiro[1], X. Manteca[2], and G. G. Mateos[3], [1]*PigCHAMP Pro Europa, S.A.*, *Segovia, Spain*, [2]*U.A. Barcelona, Spain*, [3]*U.P. Madrid*, *Spain*.

Piglets from primiparous sows (PRIM) weigh less at birth and have a higher mortality rate in lactation than piglets from multiparous sows (MULT), which probably affects performance during the fattening period. The reason for this is unknown but might be related to the lower immune transmission via colostrum, resulting in a higher susceptibility to pathogens. Five studies were performed to compare productive performance and mortality rate of piglets from PRIM vs MULT sows from 28 to 60 days of age. Average daily gain (ADG), feed intake (FI) and mortality were registered and Pig-MAP serum concentration, an acute-phase protein, was analysed at 28, 40 and 60 d of age to assess the health status and pathogen susceptibility. Piglets from the PRIM group showed a poorer performance than piglets from the MULT group. PRIM piglets had lower ADG (367 *vs* 420 g/d; P<0.001) and FI (496 *vs* 560 g/d; P<0.001) than MULT piglets. Furthermore, a higher mortality was registered in PRIM than in MULT groups (4.9 *vs* 2.4%; P<0.01), suggesting that the incidence of pathologies was higher for the PRIM group. Also, Pig-MAP serum concentration at weaning was higher in PRIM than in MULT group (1.35 *vs* 1.01 mg/mL; P<0.01). We conclude that primiparous sows progeny has a poorer performance and higher incidence of pathologies in the period from 28 to 60 days of age than progeny from multiparous sows and that the losses in performance, associated with a lower health status, might be detected through the determination of Pig-MAP concentration in serum at weaning.

Key Words: Piglet, Primiparous, Performance

314   Clinical trial testing the effect of vaccination or direct-fed microbial products on colonization of *E. coli* O157:H7 at the terminal rectum of cattle. R. Peterson*, D. Smith, R. Moxley, T. Klopfenstein, G. Erickson, and S. Hinkley, *University of Nebraska - Lincoln*, *Lincoln*.

A clinical trial was conducted to test the effect of vaccination against EHEC type III secreted proteins or feeding a direct-fed microbial product (DFM) on colonization of *E. coli* O157:H7 (EC) at the terminal rectum of commercially fed cattle. Feedlots were classified as either feeding or not feeding a DFM (Lactobacillus acidophilus and Propionibacterium freudenreichii). Vaccinated (VAC) pens of cattle were given two doses of vaccine, one at initial processing and another at reimplant. Within each feedlot, pens of VAC and nonvaccinated (NOVAC) cattle were matched by slaughter date. The sample size for each pen was calculated so that we would be 95% confident to estimate EC prevalence at 50% with a 15% precision. Terminal rectum mucosal cells (TRM) were collected by scraping the mucosa of the terminal rectum 3-5 cm proximal to the rectoanal juncture. EC was isolated and identified from TRM using standard methods involving selective enrichment, immunomagnetic separation, agar plating, biochemical and immunological testing, and PCR confirmation. The outcome of interest was the probability of detecting EC from TRM. EC outcomes were analyzed using a generalized linear mixed model (GLMM) with a logit link function accounting for random effects of pen and feedlot. Cattle were systematically selected from within 21 pens of cattle (11 vaccinated, 10 not vaccinated) selected by convenience from a cohort of 148 pens from a larger study. We collected TRM from 441 cattle from within 13 pens fed DFM and 279 cattle from within 8 pens of cattle not fed DFM. We observed a lower probability for EC colonization among vaccinated cattle (5.0%) compared with NOVAC cattle (19.9%; OR=0.20; P=0.025) within a feedyard. Feeding DFM was not associated with EC colonization (P=0.94). We concluded that this vaccine reduced EC-colonization of terminal rectum mucosal cells of commercially fed cattle.

Key Words: Direct-fed Microbial, *Escherichia coli*, Vaccination

315   Factors influencing first service conception rate in Ragusa and Pennsylvania dairy herds. J. D. Ferguson*[1], G. Azzaro[2], M. Caccamo[2], and G. Licitra[2,3], [1]*University of Pennsylvania*, *Kennett Square*, [2]*CoRFiLaC, Regione Siciliana*, *Ragusa, Italy*, [3]*D.A.C.P.A., University of Catania, Catania, Italy*.

Reproduction and production records from herd record associations for Ragusa Province and Pennsylvania were compiled from 1998 through 2004 (Ragusa) and 1996 through 2002 (Pennsylvania). Records include cow index, date of calving, lactation number, insemination information, pregnancy status, milk volume, fat and protein content, linear score, and days in milk at milk recording. Insemination information was merged with production information for the test record which occurred within 30 days after days to first insemination (DFB). Linear score for production test record prior to first insemination was retained with the record after first insemination. A total of 859 herds (117 Ragusa (region 1) and 742 PA (region 2)) and 103070 lactation records (27372 Ragusa and 75698 PA) were in the final data set. Mean values were as follows for Ragusa and PA records, respectively (sd): test day milk production, 31.9 kg (8.5) and 35.9 kg (8.8); milk energy, 21.1 mcal (5.6) and 24.6 mcal (6.0), linear score, 3.57 (2.19) and 2.79 (1.99) DFB, 88.9 (46.6) and 90.8 (42.3), days open, 160.6 (104.2) and 158.4 (90.8); services, 2.43 (1.84) and 2.34 (1.49); first service conception rate (FSTCR, %), 40.6%, and 34.0%. Logistic model of FSTCR included significant effects of herd, lactation number (1 through 5+), month of insemination, region, linear score, milk energy, quadratic effects of DFB, and interaction between region and DFB and milk energy. Linear score had significant interactions with DFB. Hosmer and Lemeshow goodness of fit test had a chi-square of 6.8 (p<.55). In general FSTCR declined with increasing lactation number, linear score, and milk energy, whereas it increased with increasing DFB. Change in FSTCR with increasing DFB and milk energy were different between Ragusa and PA cows, although general trends were similar. Factors influencing FSTCR were similar between the different regions.

Key Words: Reproduction, Milk Energy, Dairy Cows

316   Disposal reporting and disposition of culled cows by parity and herd size. A. H. Sanders* and H. D. Norman, *Animal Improvement Programs Laboratory, Agricultural Research Service, USDA*, *Beltsville, MD*.

Termination code is used to record completion of lactations, transfer, death, or reason for disposal for lactation records in the national dairy production database. The purpose of this study was to investigate the disposition of culled cows using termination codes. The latest available records for 8 million cows calving since 1998 were examined. Of these, 2.4 million were current records likely in progress, and 400,000 were for cows sold for dairy to herds not participating in DHIA testing. Disposal codes were available for 3.2 million cows in first through fifth parities from 1998 through 2004. Cow disposal records were paired with herd test records from the time of disposal, and difference from herd average for lactation milk and protein yields and average somatic cell score (SCS) were calculated. For cows culled for low production, milk yield was 2% less and protein yield was 4% less than herd average. In contrast, other cows had 4% higher milk yield and 2% higher protein yield than herd average in the lactation coded with disposal. Cows culled for mastitis or high SCS had SCS 22% above herd average. Other cows coded with disposal also had SCS greater than herd average, but only by 5%. For cows disposed of with at least 50 days open, those culled for reproduction had 246 days open, while others had only 165. Reproductive problems and low production were the most common reasons given for culling in first parity while mastitis or high SCS was the most common reason given in third parity and later. Yearly culling rates by termination code were calculated for 40,867 herd-years from 2000-2003, averaging ≥80% records passing edits and having ≥10 test days, by herd size. Overall, 33% of cows per herd-

year had terminal records and 80% of these included an indication of disposition. Reporting was similar across years and herd sizes. Distribution of disposals was fairly constant across herd sizes; however, deaths and culling for low production were more common in larger herds while culling for reproductive problems was more common in smaller herds. These results indicate that termination codes can be useful indicators for several important traits.

Key Words: Culling, Disposal, Termination Code

Ruminant Nutrition: Dairy—Transition Cows

317 Effect of transition diet on production performance and metabolism in periparturient dairy cows. J. Guo*[1], R. Peters, and R. Kohn, *University of Maryland, College Park.*

The objectives of this study were to characterize the homeorhetic change in blood metabolites and to evaluate the effect of transition diet on ketone body accumulation in periparturient cows. Twenty-eight multiparous Holstein cows were listed in order of their anticipated due dates and assigned randomly to one of two groups: with or without a transition diet. The control group received a non-lactating cow diet (1.54 Mcal NEl/kg, 10.9% CP, 53.1 % NDF) from 28 d before expected parturition, and a lactation diet (1.77 Mcal NEl/kg, 16.8% CP, 29.9 % NDF) after parturition. The treatment group received a transition diet (1.71 Mcal/kg of net energy for lactation (NEL), 16.8% of crude protein (CP), 35.2 % of neutral detergent fiber (NDF)) from 14 d before expected parturition to 14 d after calving and were fed the same diets as the cows in control group during the rest of the experimental period. Blood from coccygeal vein was sampled three times per week from 21 d before expected parturition to 21 d postpartum for analysis of glucose, nonesterified fatty acid (NEFA), βhydroxybutyrate, acetoacetate, acetone, and glycerol. Feeding a transition diet resulted in greater area under the curve (AUC) for glucose in the last 17 days of gestation, but no effect within the first 21 days in milk. Acetoacetate AUC was greater for treatment cows than for control cows across the first 21 days in milk. The AUC of NEFA and glycerol between day 15 and day 21 postpartum (after treatment) were greater for treatment cows than that for control cows. Production performance was not affected by transition diet. Plasma glycerol may be an important contributor to gluconeogenesis during the periparturient period. Feeding a transition diet around parturition was associated with greater mobilization of adipose tissue and greater exposure to ketone bodies in early lactation.

Key Words: Periparturient Cow, Ketone Body, Glycerol

318 Microarray analysis of the immunoregulatory actions of OmniGen-AF in periparturient dairy cattle. Y. Wang*[1], J. Burton[2], and N. Forsberg[1], [1]*Oregon State University, Corvallis,* [2]*Michigan State University, East Lansing.*

The goals of this study were to evaluate the mechanisms by which OmniGen-AF, a novel immunoregulatory feed additive, augments innate immunity in dairy cattle. To accomplish this, we assessed effects of OmniGen-AF on neutrophil gene expression using microarray analysis. Eight periparturient Jersey cows were used in this experiment. Four were assigned to a control diet and 4 were assigned to an OmniGen-AF-supplemented diet for 28 days prior to expected parturition. At 12-15 hours after parturition, a time which corresponds to immunosuppression in dairy cattle, blood samples (400 mL) were drawn from the jugular vein and neutrophils were purified using Percoll gradient centrifugation. RNA was isolated using Trizol and the quality of resulting RNA samples was evaluated using an Agilent BioAnalyzer. Of the eight RNA samples prepared, six (three per treatment) were of good quality. RNA from these six samples was reverse transcribed with Cy3 and Cy5 dyes and hybridized to BoTL-5 arrays. Differences in gene expression for the 1500 BoTL-5 genes were evaluated statistically following LOESS normalization. Twenty genes were differentially-regulated (P<0.05) by the addition of OmniGen-AF to the diet. Two of these (interleukin-1-beta-converting enzyme [ICE] and IL-4 receptor) were confirmed using quantitative RT-PCR. Expression of beta-actin was unaffected (P>0.05) by OmniGen-AF. Of interest, we have noted in previous sheep studies that OmniGen-AF increased concentrations of neutrophil IL-1B. Increased expression of ICE, as determined in this study, may explain how OmniGen-AF increased sheep neutrophil IL-1B. Several of the genes up-regulated by OmniGen-AF are involved in control of apoptosis. We have determined, again in sheep studies, that OmniGen-AF increases (P<0.05) neutrophil concentration in blood. A portion of its action, therefore, may arise from its ability to reduce programmed cell death in neutrophils.

Key Words: OmniGen-AF, Microarray, Dairy

319 Effect of CLA dose on milk production in early lactation dairy cows. M. J. de Veth*[1], W. M. van Straalen[2], W Koch[1], T. Keller[1], R. Hayler[1], and A. - M. Pfeiffer[1], [1]*BASF-AG, Offenbach, Germany,* [2]*Schothorst Feed Research B.V., Lelystad, The Netherlands.*

Rumen protected fat supplements containing the *trans*-10, *cis*-12 conjugated linoleic acid (CLA) isomer have been shown to be an efficient tool to reduce milk fat synthesis. In addition increased milk yield has been observed in some early lactation studies with CLA. The objective of this study was to evaluate the response at four levels of CLA dose during the first 13 weeks of lactation. Holstein cows (n = 64) were randomly allocated at calving to one of four levels of CLA dose: 0, 5 10, and 15 g/d of *trans*-10, *cis*-12 CLA. The CLA was administered in a lipid-encapsulated form and contained *cis*-9, *trans*-11 and *trans*-10, *cis*-12 isomers at the same ratio. CLA was top dressed once daily. Over the 13 wk treatment period increasing levels of CLA supplementation reduced linearly milk fat content (4.04, 3.61, 3.60 and 3.39% for 0, 5, 10 and 15 g/d *trans*-10, *cis*-12 CLA, respectively; $P < 0.05$) and milk fat yield ($P < 0.05$). The decline in milk fat content from the onset of lactation was gradual, with a nadir not reached until week 5 of lactation. Increased milk yield (6.0, 9.5, 10.5%, $P < 0.01$) and milk lactose yield ($P < 0.05$) was observed with increasing CLA dose, however, milk protein yield was only numerically increased. In addition, DMI, body weight and BCS were unaltered by CLA treatment. The proportion of those fatty acids originating from *de novo* fatty acid synthesis declined with increasing CLA dose. Milk fatty acid content of *trans*-10, *cis*-12 CLA increased linearly ($P < 0.001$) with dose of CLA from <0.001% at 0 g/d *trans*-10, *cis*-12 CLA to 0.04% with 15 g/d *trans*-10, *cis*-12 CLA. Efficiency of transfer of *trans*-10, *cis*-12 CLA into milk fat averaged 2.9% across doses, which is distinctly lower than that reported when CLA is abomasally infused. Overall, results demonstrate that CLA supplementation to early lactation cows will increase milk yield as well as reduce the content of milk fat in a dose dependent manner.

Key Words: Conjugated Linoleic Acid, Milk Fat Depression, Early Lactation

320 Dietary L-carnitine alters hepatic fatty acid metabolism and decreases liver lipid in periparturient Holstein cows. D. B. Carlson*[1], N. B. Litherland[1], J. W. McFadden[1], A. D'Angelo[1], J. C. Woodworth[2], and J. K. Drackley[1], [1]*University of Illinois, Urbana,* [2]*Lonza, Inc., Fair Lawn, NJ.*

Our hypothesis was that supplemental L-carnitine would increase oxidation and decrease esterification of fatty acids in liver, thus decreasing peripartal lipid accumulation. Multiparous Holstein cows (n=56) were supplemented with four amounts of Carniking (50% L-carnitine; Lonza, Inc.), mixed with 227 g ground corn plus 227 g dried molasses, as a topdress from d 14 before expected calving date (ECD) until 21 days in milk. Treatments were: control (CON; 0 g L-car-

220

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