

## Animal Health V

**385 Advances in respiratory disease research.** G. D. Snowden\*, *National Center for Foreign Animal and Zoonotic Disease Defense, College Station, TX.*

Respiratory disease complex is the most costly livestock disease in the USA. Recent scientific advances in metaphylactic and therapeutic treatments, pathogenic mechanisms, immunological responses, inherent host resistance, management and preconditioning treatments, and several other areas to reduce the prevalence and economic impact of respiratory diseases have been reported. Innovative nutritional approaches for animals newly introduced to a feedlot suggest changes to vitamin and mineral content, and nutrient concentrations of initial diets to reduce respiratory disease morbidity. The effect of fear and stress in livestock on their immune system is being clarified. Research is also expanding our understanding of the pulmonary innate immune system regulating antimicrobial peptide/protein expression of the respiratory tract which may lead to novel prophylactic and therapeutic modalities to minimize mortality and morbidity. The method of infection by microbial pathogens is beginning to be understood as the role of pro-inflammatory chemokines and cytokines that recruit neutrophils, macrophages, and lymphocytes to the respiratory tract is elucidated. New vaccines administered by the mucosal route are being developed from research that manipulated the genome of various bacteria and viruses to identify the role of different proteins in the pathogenesis. Genetic selection to reduce respiratory disease may become more plausible as genetic factors influencing susceptibility to respiratory diseases are identified in many livestock species. A few quantitative trait loci associated with respiratory disease resistance have also been recently identified. Although complete control of respiratory disease may not be likely in the near future, new technologies and information will likely reduce the prevalence of respiratory disease in livestock.

**Key Words:** Immune Response, Shipping Fever, Livestock

**386 An evaluation of tulathromycin treatment at post-weaning movement on the incidence of respiratory disease and on growth in commercial dairy calves.** A. Stanton\*<sup>1</sup>, S. J. LeBlanc<sup>1</sup>, R. T. Dingwell<sup>1</sup>, D. Kelton<sup>1</sup>, S. T. Millman<sup>1</sup>, J. Wormuth<sup>1</sup>, and K. E. Leslie<sup>1</sup>, <sup>1</sup>*University of Guelph, Guelph, ON, Canada*, <sup>2</sup>*CY Heifer Farm, Elba, NY.*

Bovine respiratory disease (BRD) is common following weaning and movement of calves from individual to group housing. The objective was to evaluate the effects of tulathromycin administered at the time of grouping post-weaning on the incidence of respiratory disease and on growth in dairy calves. The study was conducted at a custom heifer raising facility in New York State. 1,367 weaned dairy calves were randomly assigned to receive either tulathromycin (TUL) or oxytetracycline (TET), once SC at the time of movement. Weights and heights were measured on all calves at arrival at the farm (2-7 days of age), at enrolment (~56 days of age), and ~6 weeks post-enrolment (~97 days of age). All disease events were recorded by trained barn staff. The incidence of BRD was 8% and 13% in the TUL and TET groups, respectively. Controlling for source farm and enrolment cohort, calves treated with TET were 1.9 times more likely to be treated for BRD within 60 days post-enrollment than calves treated with TUL (P<0.001).

Independent of experimental treatment, calves with non-specific fever in the 2 weeks before enrollment were 2.7 times more likely to have BRD than calves without fever (P<0.05). In calves (n=1,207) that were not diagnosed with non-specific fever by farm staff between birth and 5 weeks of age, animals treated with TUL had an ADG 0.11 kg/d greater than TET calves (P<0.001). Accounting for treatment group, calves that had non-specific fever within 2 weeks before enrollment had a decrease in ADG of 0.11 kg/d (P<0.01). Among calves diagnosed with non-specific fever between birth and 5 weeks of age (n=160), treatment TUL or TET did not have a significant effect on ADG. Separate from the effect of experimental treatment, diagnosis of BRD within 60 days post-enrollment decreased ADG by 0.2 kg/d. Treatment did not affect mortality.

In this population of calves at risk of respiratory disease in the post-weaning period, treatment with TUL resulted in a lower incidence of BRD and increased weight gain than treatment with TET.

**Key Words:** Tulathromycin, Weaned Dairy Calves, Respiratory Disease

**387 An evaluation of a Brix refractometer for measurement of colostrum quality and success of passive transfer.** V. Biemann\*, J. Garner, C. Throop, N. Perkins, and K. Leslie, *University of Guelph, Guelph, ON, Canada.*

New techniques to evaluate colostrum and passive transfer in dairy cattle are needed. These methods must be simple, rapid, accurate, inexpensive, and adaptable to farm conditions. The Brix refractometer was evaluated in colostrum samples from 231 Holstein cows from 3 dairy herds from May to August 2007. In addition, serum samples were collected from a subset of the newborn calves from these cows within 1 to 4 days of age. The immunoglobulin concentration of the colostrum samples was measured by a radial immunodiffusion (RID) assay. The correlation coefficient between the RID and the Brix scores for the 222 colostrum samples was R<sup>2</sup>=0.32. Using a Brix score of 18%, the sensitivity and specificity for identifying colostrums samples with inadequate IgG concentrations (50g/L) was 34% and 94%, respectively. By these results, use of the Brix refractometer to identify and discard colostrum of inferior quality for first feeding in dairy calves would result in a large number of false negative colostrums being eliminated. Factors affecting these test characteristics were evaluated. Unlike the Colostrometer™, no significant difference was found between Brix scores taken at 3 different colostrum temperatures (5, 20 and 38°C). Interestingly, no substantial difference in colostrum quality was observed between primiparous and multiparous animals in this study. A total of 202 calf serum samples were evaluated using the Brix refractometer and a standard digital refractometer to measure serum total solids (TS). A correlation coefficient of 0.77 was determined between the Brix and digital refractometer results. These data indicate considerable utility of the Brix instrument for assessment of passive transfer in dairy calves. There is a need for further evaluation and refinement of the Brix refractometer for use as a tool for assessment of colostrum quality. Yet, having one instrument for both evaluations would make it a very useful farm management tool.

**Key Words:** Refractometer, Colostrum, Calves

**388 Comparison of Brix (sugar) refractometer and colostrometer for evaluation of colostrum quality in dairy cows.** P. Dinsmore<sup>\*1</sup> and A. Skidmore<sup>2</sup>, <sup>1</sup>Colorado State University, Fort Collins, <sup>2</sup>Schering-Plough Animal Health, Alexander, NY.

Measurement of colostrum Ig is an important on-farm procedure to ensure adequate transfer of Ig to the newborn calf. A colostrometer, which measures the specific gravity (SG) of colostrum, is currently available but not widely used. It has disadvantages: 1) colostrum SG is more strongly associated with protein than Ig, and 2) SG is affected by colostrum temperature. A Brix sugar refractometer (Brix) has been useful in estimating equine colostrum quality. It is simple and rapid to use. The study objective was to evaluate the Brix for measuring dairy cow colostrum quality and to compare it to the colostrometer. First-milking colostrum was obtained from 117 cows on a large Colorado dairy. Colostrometer measurements were made by farm personnel. Brix measurements were made in triplicate on fresh samples and were performed by the senior author. A subset of samples (17) was tested at 3°C, 20°C, and 38°C. The samples were submitted for radial immunodiffusion (RID) measurement of IgG, as well as fat and protein determination. No temperature effect was found, and the triplicate Brix measurements were statistically identical for a given sample. When reading the Brix values, a wide band of color transition was found in 25% of samples and was found to be strongly associated with fat level in the sample. The multiple linear regression model with the highest R<sup>2</sup> (0.623) included Brix value and lactation group. The correlation between colostrometer and RID was 0.36. At the minimum colostrum IgG concentration of 50mg/ml indicating adequate colostrum quality, the Brix value was 23 and 20 for lactation 1 and lactation 2+ cows, respectively. Using these cutoff values and RID=50 mg/ml as the gold standard, the specificity of the colostrometer, Brix for lactation 1, and Brix for lactation 2+ were 0.25, 0.56, and 0.37, respectively. Compared to the colostrometer, the Brix refractometer values were more highly correlated with colostrum IgG values, was simpler to use, and was unaffected by temperature of the colostrum.

**Key Words:** Colostrum, IgG, Refractometer

**389 Thermal imaging of the bovine muzzle and the correlation to rectal temperature.** S. M. Behrends\*, T. B. Schmidt, P. Ryan, S. Willard, M. McGee, C. Welch, C. Trejo, J. O. Buntyn, and C. Huston, Mississippi State University, Mississippi State.

Crossbred calves (n=133) weighing an average of 228.82 ± 22.15 kg were evaluated upon arrival at a 10,000-head capacity backgrounding facility to evaluate an easily obtainable measurement taken at arrival as a prognostic tool for sorting incoming cattle. Standard protocol upon arrival was individual ID (ear tag), antiemetic application and vaccinations for respiratory disease (modified live vaccine) and clostridial pathogens. In addition to arrival protocol, heifers were weighed, rectal temperature determined, and a thermal image (FLIR ThermaCAM EX320) was captured. Thermal images were collected at a standard distance of 76.2 cm from the restraining chute. To determine the correlation between rectal temperature and thermal images; the image of Planum Nasolabiale Area (PNA) of the muzzle was highlighted and then bisected by one vertical line, one horizontal line, and two diagonal lines into quadrants that intersected at the geometric center of the PNA. Muzzle temperature was positively correlated with rectal temperature taken at the time of processing (P<0.01). The most highly correlated area on the muzzle was the convergence of lines in the geometric center

of the PNA (r=0.50; P<0.01) and the least correlated measure was the diagonal line bisecting the PNA (r=0.34; P<0.01). Factor 1 from principle component analysis (PCA) had high loadings for quadrants bisected by the vertical line (0.99 and 0.97; PCA). Thermal temperature measures of the bovine muzzle appear to hold promising correlations to rectal temperature and with further investigation possibly provide a tool for early detection of stress and susceptible cattle.

**Key Words:** Body Temperature, Cattle, Muzzle

**390 Sorting heifers with high risk of bovine respiratory disease based on arrival serum haptoglobin concentration.** B. P. Holland\*, L. O. Burciaga-Robles, D. L. Step, and C. R. Krehbiel, Oklahoma State University, Stillwater.

Heifers (n=337; initial BW=241±17 kg) were assembled at a western Kentucky order buyer facility and shipped in two groups 957 km to Stillwater, OK. Upon arrival blood was collected and serum analyzed for haptoglobin (Hp) concentration. Heifers were sorted into 3 groups according to arrival Hp concentration. Groups were LOW (<1 µg/100 mL), MED (1 to 3 µg/100 mL), and HIGH (>3 µg/100 mL). Within 36 h after arrival, calves were penned according to groups and fed for a 63-d receiving/growing period. Body weight and blood for Hp analysis were collected on d 7, 14, 21, 42, and 63. Blood for Hp analysis was also collected at the time of antimicrobial treatment for bovine respiratory disease (BRD). Haptoglobin concentrations on arrival were 0.79, 1.93, and 7.60 µg/100 mL for LOW, MED, and HIGH, respectively (P<0.01). On d 7, Hp tended (P=0.08) to be greater for HIGH than LOW and MED. Similarly, Hp tended (P=0.09) to be least for LOW, intermediate for MED, and greatest for HIGH on d 21. Arrival BW was greater for LOW and HIGH than MED (P<0.01). However, BW did not differ throughout the remainder of the trial (P>0.27). Average daily gain was least (P=0.01) for HIGH from d 1 to 7, but no other differences (P>0.19) in ADG were observed. Overall DMI was not different (P=0.89) among treatments, but was greater (P=0.02) for LOW (6.26 kg/d) and MED (5.74 kg/d) than HIGH (5.18 kg/d) from d 1 to 21. Overall morbidity due to BRD was greater (P=0.01) for MED and HIGH (66.9 and 76.2%, respectively) than for LOW (50.8%). The number of heifers requiring three treatments was also greater (P=0.01) for MED and HIGH (28.2 and 28.5%, respectively) than for LOW (9.78%). However, heifers considered chronically ill was greatest (P=0.03) for MED (18.3%), intermediate for HIGH (9.6%), and least for LOW (5.2%). Total mortality and case fatality rate did not differ (P>0.68) among groups. Average daily gain and DMI early in the growing period, as well as overall morbidity, were affected by arrival Hp concentration. Arrival Hp concentration may be a beneficial tool for making management decisions for calves with high risk of BRD.

**Key Words:** Acute Phase Protein, Bovine Respiratory Disease, Calves

**391 Effects of on-arrival vs. delayed clostridial or modified-live respiratory vaccinations on health, performance, bovine viral diarrhea titers, and physiological measures in high-risk, newly received beef calves.** J. T. Richeson<sup>\*1</sup>, E. B. Kegley<sup>1</sup>, M. S. Gadberry<sup>2</sup>, P. A. Beck<sup>3</sup>, J. G. Powell<sup>1</sup>, and C. Jones<sup>4</sup>, <sup>1</sup>University of Arkansas, Fayetteville, <sup>2</sup>University of Arkansas, Little Rock, <sup>3</sup>University of Arkansas, Hope, <sup>4</sup>Boehringer-Ingelheim Vetmedica, Inc., St. Joseph, MO.

Stress commonly associated with weaning, marketing, and shipment of feeder cattle can compromise immune function, and vaccine administration during immunosuppression may reduce vaccine efficacy and calf growth. Four treatments were compared in a 2 × 2 factorial arrangement to evaluate the effect of on-arrival (d 0) vs. delayed (d 14) administration of 7-way clostridial (Alpha<sup>®</sup> 7, Boehringer-Ingelheim Vetmedica, Inc. [BIVI]; CLOS) and modified live viral respiratory (Express<sup>®</sup> 5, BIVI; RESP) vaccines. Crossbred calves (n = 263) were weighed (238 ± 1.2 kg), stratified by gender, and assigned randomly to vaccination treatment: 1) arrival CLOS, arrival RESP (ACAR), 2) arrival CLOS, delayed RESP (ACDR), 3) delayed CLOS, arrival RESP (DCAR), and 4) delayed CLOS, delayed RESP (DCDR). Gain did not differ ( $P = 0.74$ ) averaging 0.98, 0.93, 0.95, and 0.91 kg/d for ACAR, ACDR, DCAR and DCDR, respectively for the entire 56-d trial. Vaccination timing did not affect morbidity ( $P = 0.49$ ); however, there tended to be CLOS ( $P = 0.07$ ) and RESP timing effects ( $P = 0.09$ ) on d to initial bovine respiratory disease (BRD) treatment episode. Average d to initial BRD treatment were less for ACAR (6 ± 0.8 d) compared to DCDR (8 ± 0.8 d;  $P = 0.01$ ). Serum cortisol concentrations were greater ( $P \leq 0.01$ ) on d 0 than 14 or 28 but no treatment × day interaction ( $P = 0.21$ ) was observed. RESP timing affected ( $P = 0.001$ ) serum BVD titer levels, with greater ( $P < 0.01$ ) levels in calves administered RESP vaccine on arrival. Delaying CLOS or RESP vaccination did not affect gain or morbidity in high risk, newly received stocker calves. Calves administered RESP vaccine on d 0 developed antibody titers to BVD earlier than delayed RESP treatments.

**Key Words:** Receiving Cattle, Vaccination, BRD

**392 Effect of length of time between maternal separation and shipping on post-weaning performance of beef calves weaned during the fall.** J. W. Bolte<sup>\*1</sup>, K. C. Olson<sup>1</sup>, J. R. Jaeger<sup>1</sup>, T. B. Schmidt<sup>2</sup>, D. U. Thomson<sup>1</sup>, B. J. White<sup>1</sup>, R. L. Larson<sup>1</sup>, A. Sproul<sup>1</sup>, L. A. Pachenco<sup>1</sup>, and M. D. Thomas<sup>1</sup>, <sup>1</sup>Kansas State University, Manhattan, <sup>2</sup>Mississippi State University, Starkville.

Ranch-of-origin weaning periods of between 30 and 60 d are recommended for preconditioning beef calves. Our objective was to test the validity of this recommendation for calves aged 160 to 220 d and weaned during the fall. Angus × calves (n=433) were stratified by age and assigned randomly to 1 of 5 weaning dates that corresponded to the length of time between separation from the dam and shipment to an auction market: 60, 45, 30, 15, or 0 days. Calves were vaccinated against common diseases 14 d before weaning and again on the day of weaning. On a common shipping date (d 0; November 7), calves were transported 3 h to an auction market and held for 12 h. Calves were then transported 1 h to a feedlot. All calves were fed common pre- and post-shipment diets ad libitum. Calf ADG during the 60 d preceding shipping tended to increase linearly ( $P=0.09$ ) with longer weaning periods. Incidence of undifferentiated fever during the 14 d after maternal separation was greater ( $P<0.01$ ) for calves weaned 60 d than those weaned 45, 30, or 15 d. Calf BW at shipping tended to increase linearly ( $P=0.06$ ) with successively longer weaning periods. Calf BW 30 and 60 d after shipping

increased linearly ( $P<0.01$ ) with successively longer weaning periods; however, ADG was similar ( $P>0.6$ ) between treatments from d 1 to 30 and d 31 to 60 after feedlot arrival. Incidence of undifferentiated fever during the 60 d after shipping was greater ( $P<0.01$ ) for calves weaned 0 d than those weaned 60, 45, 30, or 15 d. Under the conditions of our study, successively longer ranch-of-origin weaning periods improved calf ADG prior to shipping but did not affect ADG during the 60 d following feedlot arrival. Treatments retained their relative ranks in body size from shipping to the end of the study. Weaning management influenced when calves were most likely to become ill.

**Key Words:** Preconditioning, Weaning, Beef Calves

**393 Effects of *Mannheimia haemolytica* challenge on blood gas, oxygen consumption and net splanchnic flux of volatile fatty acids in fed or fasted steers.** L. O. Burciaga-Robles<sup>\*</sup>, C. R. Krehbiel, D. L. Step, J. W. Dillwith, R. Madden, M. Montelongo, A. W. Confer, J. N. Gilliam, B. P. Holland, and C. L. Goad, Oklahoma State University, Stillwater.

This experiment evaluated arterial blood gas concentration, net splanchnic flux of VFA and O<sub>2</sub> consumption during a bovine respiratory disease (BRD) challenge. Twenty-two steers (BW = 320±24 kg) with chronic catheters to measure blood flow and net flux across the portal-drained viscera (PDV) and liver were used. Arterial, portal, and hepatic blood samples were collected at 1.5-h intervals on d 0, 1, 2, and 3. Treatments (2×2 factorial arrangement) were: 1) ad libitum feeding and not challenged (FED/CON); 2) ad libitum feeding and challenged (d 0) with *M. haemolytica* via a tracheal tube (FED/CH); 3) 72-h fasting and not challenged (FAST/CON); 4) 72-h fasting and challenged (FAST/CH). All data were analyzed using repeated measures and first-order autoregressive correlation structure. FED or FAST did not affect blood gas variables, whereas CON steers had lower blood pH (7.45 vs 7.47;  $P=0.01$ ), BeB (3.38 vs 4.25 mmol/L;  $P=0.01$ ), base excess of extra cellular fluid (2.45 vs 3.51 mmol/L;  $P=0.01$ ) and greater hematocrit (27.1 vs 24.5%;  $P=0.03$ ) and O<sub>2</sub> concentration (2.69 vs 2.52 mM;  $P=0.007$ ) compared with CH animals. FED steers had greater PDV (-190 vs -129 mmol/h;  $P=0.03$ ), TST (-438 vs -269 mmol/h;  $P=0.01$ ), and tended ( $P=0.07$ ) to have lower (-194 vs -206 mmol/h) liver O<sub>2</sub> consumption than FAST steers. FED animals had greater (1.20 vs 0.79 mM;  $P<0.001$ ) arterial acetate concentration compared with FAST; arterial propionate, butyrate, isobutyrate, isovalerate and valerate concentrations were not affected. FED steers had increased portal flux of propionate (67.3 vs 33.7 mmol/h;  $P=0.022$ ), and hepatic removal of propionate (-61.6 vs -25 mmol/h;  $P=0.001$ ), isobutyrate (-4.18 vs -1.43;  $P<0.001$ ) and isovalerate (-7.46 vs -2.55 mmol/h;  $P=0.006$ ). Our data confirms that BRD alters arterial blood gas profile, but generally did not affect O<sub>2</sub> consumption or VFA flux across splanchnic tissues. Fasting decreases O<sub>2</sub> consumption; however, energy demands by splanchnic tissues may not be altered during an acute challenge with BRD.

**Key Words:** Bovine Respiratory Disease, Net Flux, Oxygen Consumption