519 Validation of a color automated tracking system for activity and pen location of group housed weanling pigs. J. W. Dailey*[1], N. Krebs[2], J. A. Carroll[1], and J. J. McGlone[2], [1]*Livestock Issues Research Unit, Agricultural Research Service-USDA*, *Lubbock, TX*, [2]*Texas Tech University*, *Lubbock*.

Knowing where animals are located throughout the day can be important in some studies. While scan sampling methods can be imprecise, continuous video observation is precise but time-consuming. Commercial automated tracking systems (ATS) quantify animal behavior by assigning an X, Y coordinate for an animal's location at a given time. The objective of this study was to validate an ATS, *Ethovision*, using the 'color' tracking method compared with a human observer using the *Observer 5.0* (HOB). Nursery pigs (n = 44, 1 pig was removed from the study due to technical problems with the HOB) were group housed (n = 4/pen). Each pig in the pen had a different color tape around its shoulders (11 replications/color). Pigs were video recorded continuously for 1 h with color cameras at 30 frames/s. Videos were scored for a 1 h period for the time spent on the right half of the pen. Data obtained with the ATS were compared to data collected by HOB by ANOVA and regression analyses. The following results were obtained using 10 pixels as a parameter of detection in ATS. No difference ($P = 0.597$) was observed between HOB and ATS for the time spent on the right. A linear regression comparing the methods of observation for ′time spent on the right′ yielded an r^2 of 0.9102 (or r = 0.954, $P < 0.01$) which indicated ATS as an assay was a precise predictor of HOB measurements (using 100 pixels, there was no difference in the means but the r^2 was 0.78). The simple linear regression model was HOB = 0.962 ATS + 3.6929 ($SE_b = 0.047$). The number of pixels used in the ATS must be optimized to accurately interpret animal movement. Additionally, the surface area covered by the tape, the color and elasticity of the tape, and the lighting system in the room can also affect the efficiency of the ATS. In conclusion, the ATS generated mean values similar to behavioral data collected by HOB. The r^2 demonstrates that the ATS closely predicted data obtained by HOB. The ATS is recommended for collection of this type of behavioral information.

Key Words: Pigs, Behavior, Technique

520 The effects of prenatal stress on the ano-genital distance and growth hormone immuno-positive cells in the pituitary gland of the pig. E. L. Schenck*[4], D. C. Lay Jr.[1], H. G Kattesh[2], J. E. Cunnick[3], M. J. Daniels[5], M. J. Toscano[4,6], and K. A. McMunn[1], [1]*USDA-ARS Livestock Behavior Research Unit*, *West Lafayette, IN*, [2]*University of Tennessee*, *Knoxville*, [3]*Iowa State University*, *Ames*, [4]*Purdue University*, *West Lafayette, IN*, [5]*University of Florida*, *Gainesville*, [6]*University of Bristol*, *Bristol, UK*.

Exposing pregnant mammals to prenatal stress has been shown to alter the stress response of their resulting offspring. Research in rodents has shown that prenatal stress can modify aspects of gender behavior and morphology. Ano-genital distance is the distance between the anus and genital area. A decrease in ano-genital distance in males indicates a decrease in masculinization. Our objective was to determine if prenatal stress altered the ano-genital distance and pituitary gland of piglets. Sow treatments consisted of i.v. injections of adrenocorticotrophin (1 IU/kg BW) (ACTH, n=11), exposure to rough handling for a 10-min duration (RH, n=13), or no treatment (CONT, n=13) once a week during d 42 to d 77 of gestation. Ano-genital distance (a ratio of body length:ano-genital distance) was measured after birth in all male piglets. One male piglet per dam was sacrificed at 2-mo of age and the pituitary gland was collected for immunocytochemistry for analysis of growth hormone. Data were analyzed using the GLM procedures of SAS. Male piglets born to dams who received ACTH had a larger ano-genital ratio (a smaller ano-genital distance) compared to piglets from the roughly handled sows or the control sows ($P < 0.0001$; 2.01 ± 0.03; 1.91 ± 0.3; 1.87± 0.02 respectively). There were no differences ($P > 0.10$) among treatment groups in the number of immuno-positive cells for growth hormone in the pituitary gland. Adjusted weaning weight was found to be greater for pigs born to the CONT and RH handled sows as compared to piglets from sows who received ACTH ($P < 0.05$). These data indicate that prenatal stress may decrease masculinization during development and possibly decrease reproductive success later in life. The weight differences in the ACTH group at weaning may be due to the high level of prenatal stress activated by the ACTH injections. The differences in weight may imply that an increase in prenatal stress (ACTH) alters pre-weaning weight gain; however, a 2-mo period appears to be sufficient for the quantity of pituitary cells positive for growth hormone to recover from stress.

Key Words: Swine, Prenatal, Gender

Animal Health II

521 Effect of maternity pen management on risk of early calfhood diseases in dairy heifer calves during the preweaning period. P. Pithua*, S. J. Wells, and S. M. Godden, *University of Minnesota*, *St. Paul*.

The objective of this study was to determine whether heifer calves born in individual maternity pens will have a lower risk for experiencing calfhood diseases versus heifer calves born in a multiple cow maternity housing area in a randomized clinical trial, conducted between January, 2005 and December, 2005. Four hundred and fifty two dairy heifer calves were recruited into the study from three Minnesota dairy farms. Pregnant cows were randomly allocated to calve in either the individual maternity pen (treatment group) or multiple cow maternity housing area. Fecal material and placental remains were removed from the individual maternity pens between each calving and calves were separated from their dams and removed from the maternity area, within 2 hours of birth. Calves born in multiple cow pens had varying times of separation from their dams. All calves were housed in individual hutches for 8 weeks and later transferred to group pens of 10 calves each. Calves born in individual calving pens were not commingled with those born in the multiple calving areas during the follow up period. Standard disease monitoring and diagnosis protocols were developed for the study. Disease events (enteritis and pneumonia) experienced by the calves, during the first 3 months of birth and treatments administered, were recorded by the calf managers. Incidence risk of disease and mortality, experienced by calves in either group were compared using Chisq-Test statistic (Table1). Days at risk for calves born in either calving location were compared using product limit estimates of survivor functions and there was no evidence to suggest differences in survival experience between groups (Log-Rank

Test: Chisq=0.0744; df =1; p=0.79). Results suggest no difference in the incidence of calf morbidity and mortality between calves born in individual maternity areas when compared with those born in multiple cow maternity environments.

Table1: Incidence risks and rates (cases/1000 calf-days at risk) for calfhood diseases and χ2-test comparing morbidity and mortality risks between calves born in individual calving area versus calves born in multiple calving area

Disease	Total (n=452)		Individual pen (n=241)		Multiple pen (n=211)				
	Risk	Rate	Risk	Rate	Risk	Rate	χ2	df	p
Morbidity	0.38	6.8	0.38	6.9	0.38	6.7	0.002	1	0.9
Enteritis	0.32	5.7	0.32	5.8	0.31	5.5	0.061	1	0.8
Pneumonia	0.06	1.1	0.06	1.0	0.07	1.2	0.317	1	0.5
Arthritis	0.22	0.004	0.00	0.0	0.005	0.08	...	...	0.5*
Mortality	1.10	0.020	0.02	0.03	0.005	0.08	...	...	0.3*

* P-values based on Fisher's Exact Test.

Key Words: Randomized clinical trial, Maternity pen, Calfhood diseases

522 Effect of feeding heat-treated colostrum on serum immunoglobulin G concentrations in dairy calves. D. Hagman, S. Godden*, J. Johnson, T. Molitor, and T. Ames, *University of Minnesota*, *St. Paul*.

There has recently been increasing interest in feeding heat-treated colostrum to reduce transmission of infectious pathogens to calves. However early research pasteurizing colostrum using the same high temperatures as are typically used to pasteurize milk resulted in significant denaturation of colostral antibodies and often unacceptable feeding characteristics. Recent laboratory studies have suggested that heat-treating bovine colostrum at 60°C for 60 min would result in good pathogen kill while preserving antibodies. The objective of this study was to describe the effect of feeding heat-treated bovine colostrum on passive transfer in newborn calves. This study was conducted on a commercial transition cow management facility in Baldwin, WI. 8 to 16 L batches of fresh bovine colostrum were split into two equal aliquots. The first aliquot was maintained as raw, and refrigerated immediately in 4 L bottles. The second aliquot was heat-treated in a commercial batch pasteurizer at 60°C x 60 min, and then refrigerated in 4 L bottles. Fifty newborn singleton Holstein calves weighing > 70 lbs at birth were systematically (i.e. every other calf born) assigned to be fed 3.8 L of either raw (control) or heat-treated (treated) colostrum within 2 hrs of birth, using an esophageal feeder. Blood samples were collected at 0 and 24 hrs of age for determination of serum total protein (TP) and serum immunoglobulin G (IgG) concentrations. There was no effect of treatment on serum measures at 0 hrs of age. However mean (SD) calf serum TP and IgG concentrations were significantly greater at 24 hrs of age for calves fed heat-treated colostrum (TP = 6.3 ± 0.5 gm/dl; IgG = 22.3 ± 4.6 mg/ml) as compared to calves fed raw colostrum (TP = 5.9 ± 0.7 gm/dl; IgG = 17.5 ± 5.5 mg/ml) ($P < 0.05$). Though potential economic and health benefits still need to be described, these results suggest that farms can feed calves heat-treated colostrum to reduce pathogen exposure while maintaining, or even improving, passive transfer of colostral antibodies.

Key Words: Colostrum, Pasteurization, Immunoglobulin G

523 Effects of egg-derived antibody supplements on health and performance of veal calves. D. Wood*[1], J. Sowinski[1], and S. Hayes[2], [1]*Animix*, *Juneau, WI*, [2]*Milk Products*, *Chilton, WI*.

An experiment was conducted to measure effects of egg-derived antibody supplements on calf health and performance. Sale-barn sourced Holstein bull calves (n = 128; initial BW = 39 kg; app. 1 wk of age) were randomly placed in individual stalls in 2 barns. Calves were randomly assigned to receive 1 of 3 treatments for app. 12 d, including 1) no supplement (Control; n = 44), 2) single source of commercially available egg-derived antibody (CEA; n = 42), or 3) blend of 3 egg antibody products with MOS, beta glucan, serum and probiotics (CEA-Fortified; n = 42). All egg antibody products were fed to manufacturer guidelines. Calves were started on 24:18 veal prestarter and transitioned to 22:16 starter. The single CEA source was from hens hyper-immunized with 8 calf pathogens. The blend of 3 egg antibody sources had titer to 12 calf pathogens. Individual calf BW was determined on d 0 and d 34 and 40 for rooms 1 and 2, respectively. Although there was a significant room effect ($P = 0.01$) for calf ADG (0.61 vs. 0.69 kg/d for rooms 1 and 2, respectively), there was no treatment x room interaction ($P = 0.84$). Calf ADG did not differ ($P = 0.53$) among treatments (0.67, 0.64, and 0.64 kg/d for Control, CEA, and CEA-Fortified, respectively; SEM = 0.03). The % of calves treated for illness did not differ ($P = 0.80$) among treatments. The avg. number of medical treatments/calf did not differ (P = 0.80, 0.41 treatments/calf; SEM = 0.10). The total number of medical interventions provided to ill calves did not differ ($P = 0.80$, 2.1, 2.2, and 1.8 total treatments for Control, CEA, and CEA-Fortified, respectively; SEM = 0.50). Mortality did not differ between treatments. Total mortality in the two rooms was 11%. Randomly pulled fecal swabs (17 swabs) were collected during peak scour period and analyzed for clostridium perfringens A, B, C & D, virulent E coli and presence of salmonella. Clostridium type A was the only pathogen detected (11 swabs). Under conditions in this study, egg antibody supplements had no effect on veal calf performance or health.

Key Words: Calf, Egg, Antibody

524 A survey of bovine practitioners to determine factors associated with acute bloat syndrome in pre-weaned dairy heifers. D. E. Shoemaker*[1], P. J. Rajala-Schultz[2], and L. Midla[3], [1]*The Ohio State University*, *Wooster*, [2]*The Ohio State University*, *Columbus*, [3]*The Ohio State University*, *Marysville*.

Acute bloat syndrome (ABS) is an emerging problem in dairy herds. Affected calves suffer from the sudden onset of bloat/abdominal distension and die, generally within 4 to 24 hours. To identify factors associated with ABS, a survey was developed and sent to members of the American Association of Bovine Practitioners (AABP), self-identified as dairy or mostly large animal veterinarians (BPs). Response rate was 31% (708 of 2.312), with 39% (276 of 708) responding as having seen a case of ABS. In the previous 12 months, half of these BPs reported seeing ≥ 4 cases of ABS, with 5% seeing > 40 cases. Over half the BPs saw cases sporadically, with only 6.5% reporting multiple outbreaks (an outbreak is ≥3 cases in 3 weeks.) The abomasum was the primary organ involved in almost 2/3 and the rumen in 1/4 of the reported cases. No necropsy was performed in 27% of reported cases. No bacteria were isolated in 61% of samples submitted for laboratory analysis. In 31% of cases *Clostridium spp.* and in 8% of cases *Sarcina spp.* were reported. ABS cases were observed in all age groups (0 to >21 days). Less than 3% of cases were reported for calves <4 days old. No clear seasonal patterns emerged. Symptoms most frequently

reported included abdominal distension on both sides (66%), fluid slosh (56%), colic (47%), and dehydration (42%). Only 23% reported diarrhea. 60% of the cases resulted in death. Responses regarding management practices of the calf's herd reflected common management practices (MPs). No particular MPs were excluded. More than 62% of the time, BPs rated overall calf management as very good or excellent. 88.5% of the time, management was rated as at least good. This survey begins to identify factors associated with ABS. Further work is needed to clearly identify the cause(s) of this disease as well as potential therapies and preventive measures.

Key Words: Calves, Acute bloat syndrome

525 Descriptive epidemiology of adult dairy cow mortalities. J. A. Severidt*, F. B. Garry, G. H. Gould, J. R. Wenz, and J. E. Lombard, *Colorado State University*, *Fort Collins*.

Mortality rates for adult dairy cows have been increasing over the past couple of decades and are now between 4 and 12% at the state level. The objective of this study was to determine the cause of death of adult dairy cattle on a modern dairy farm and to identify risk factors associated with mortality. Adult mortalities from March 1, 2005 to January 31, 2006 on a 1400 cow dairy were examined by necropsy either in the field or at the Colorado State Veterinary Diagnostic Laboratory. Gross necropsy findings and histology were used to determine the cause of death. Previous health and production records were obtained and evaluated for every necropsied cow. Producer assigned cause of death was compared with necropsy findings. Serum was collected from enrolled fresh cows at 3-5 DIM and biochemistry panels were run on 10 cows that died within 10 days postpartum and 10 surviving herd mates matched by lactation and calving date. Of 81 cows that died, 70 were necropsied. Thirty percent of deaths were in first lactation animals and 46% of all of the deaths occurred within the first 30 days postpartum. Deaths were attributed to musculoskeletal injury (20%), digestive disorders (14%), and uterine disorders (11%). Miscellaneous health problems accounted for 21% of the mortalities, including such conditions as abdominal hemorrhage (non-uterine artery related), arterial thrombosis, and lymphoma. In 30% of the cases, the producer's reasons for death were incorrect when compared to necropsy findings. Of all the mortalities, 28% of the cases were reported as an unknown cause by the producer, whereas 6% were unknown after necropsy. A significantly larger proportion of cows that died had elevated creatinine kinase and aspartate aminotransferase, suggesting muscle damage, compared to cows that remained in the herd ($P < 0.02$). Results of this preliminary study suggest routine necropsy provides information about the causes of dairy cow mortality that is currently unavailable for making informed management changes. Many deaths are attributable to disease processes that could be minimized or avoided through directed management interventions, especially during the transition period.

Key Words: Mortality, Dairy

526 The effect of digit amputation or arthrodesis surgery on culling and milk production in Holstein dairy cows. R. C. Bicalho*, S. H. Cheong, L. D. Warnick, D. V. Nydam, and C. L. Guard, *Cornell University*, *Ithaca, NY*.

The objectives of the study were to evaluate the effects of digit amputation and arthrodesis surgery performed in the field on culling and milk production during the early post-surgical period. Cows from three commercial dairy farms in New York State were recruited for the study. A total of 49 cows that had digit amputation were matched with 68 control cows, while 17 cows that had arthrodesis surgery were matched with 20 control cows according to lactation, days in milk, and lactating at time of treatment of the case. Cumulative milk production for the first 60 days after the procedure was calculated in DC305 (Dairycomp305) for controls and treated cows. Milk production data was analyzed using PROC mixed of SAS ver. 9.1 (SAS Institute, Cary NC). The survival of cows with surgery was compared to survival of matched controls using Cox's proportional hazards model (SAS 9.1 Cary North Carolina, USA). Performance was not directly comparable between amputated and arthrodesis groups because cows were not randomly assigned to the two treatment groups. Therefore, each surgical group was evaluated relative to their respective matched control groups. Amputation cows had a significantly higher culling rate and estimated median survival of 68 days compared to 585 days for their control group. Arthrodesis cows had a median survival time of 286 days and their control cows had a median survival time of 246 days. Total milk production for the first 60 days post surgery was significantly lower for both amputation (1533 kg) compared to control (2121 kg) and arthrodesis (1883 kg) compared to control (2250 kg) groups. Septic arthritis of the distal interphalangeal joint was the most common condition treated by surgery accounting for 70.5% of arthrodesis cases and 73.5% for digit amputation. Toe necrosis accounted for 14.3% of amputation cases and retroarticular abscess made up the rest of the digit amputation (12.2%) and 29.5% of arthrodesis cases.

Key Words: Digit amputation, Arthrodesis, Milk production

527 Mechanical properties of the hoof horn of dairy cows during lactation. B. Winkler[1] and J. K. Margerison*[2], [1]*University of Plymouth, School of Biological Sciences*, *Plymouth, DEVON, UK*, [2]*Massey University, Institute of Food, Nutrition and Human Health*, *Palmerston North, NZ*.

The objective of this experiment was to compare the mechanical strength and lesion score of hoof horn in dairy cows over the postpartum period when housed in a cubicle system. Mechanical tests were completed on sole horn taken from a total of 36 live cows at 50 (p1), 100 (p2) and 160 (p3) days postpartum (pp). Simultaneously, all claws were assessed for lesions score (LS) of the sole (S) and white line (WL) areas of the hoof. Horn samples were collected from all claws and analysed for elastic modulus (EM) and punch force (PR). Each measurement was repeated 8 times on the S and WL areas of each claw. Horn samples were scored for haemorrhage levels, using a 6 point scale (0- no haemorrhage and 5- severe). PR was significantly ($P<0.001$) lower in samples with high haemorrhage scores, demonstrating a lower structural integrity (8.72^{a}, 8.53^{a}, 8.06^{b}, 7.75^{b}, 6.08^{c} and 4.99^{d} N for scores 0 to 5 respectively). Total LS of the S area increased significantly at day 160 (p1- 1241^{b}, p2-1295^{b}, p3- 1676^{a}) and the WL at day 100 pp (p1- 1042^{b}, p2- 1448^{a}, p3-1710^{a}) ($P < 0.001$). The S and WL areas of the hind outer (HO) claws had significantly higher lesion scores than other claws (sole HO- 340.2^{a}, other- 149.4 to 184.2^{b}; WL HO- 267.5^{a}, other- 168.4 to 228.9^{b}) ($P < 0.001$). PR of the sole area was significantly lower in the HO claws, which had higher lesion scores, when compared to other claws (HO- $7.2N^{a}$, other- 8.0^{a} to $9.2N^{a}$) ($P < 0.001$). PR decreased as day pp increased and lesion scores increased (p1- 9.0^{a}, p2- 8.6^{ab}, p3- 8.2^{b}N) ($P < 0.001$). PR of the WL area was significantly lower in the hind left (HL) claws compared to other claws (HL- $4.9N^{b}$, other- 5.5 to $6.2N^{b}$) and was significantly lower ($P < 0.01$) at day 160 pp(p1- 7.1^{a}, p2- $6.2^{a,b}$, p3- 5.6^{b}). EM of the sole and WL areas decreased ($P < 0.01$) at day 100 pp (S p1- 48.8^{a}, p2-

17.7[b], p3- 18.2[b] N/mm2; WL p1- 32.2[a], p2-17.8[b]), p3-19.7[b] N/mm2), but did not differ between claws. Mechanical tests accurately reflect changes in claw horn lesions following parturition.

Key Words: Lameness, Dairy cattle, Hoof

528 Evaluation of Excede for control of BRD when administered at initial processing or at revaccination within pasture and feedlot receiving systems. V. Bremer*[1], G. Erickson[1], T. Klopfenstein[1], D. Smith[1], K. Vander Pol[1], M. Greenquist[1], D. Griffin[1], G. Sides[2], and L. Bryant[2], [1]*University of Nebraska*, *Lincoln*, [2]*Pfizer Animal Health*, *New York, NY*.

Preventing bovine respiratory disease (BRD) among incoming calves is a challenge for feedlot or backgrounding systems. The objective of this study was to determine the effect of Excede® at arrival or at revaccination on morbidity, mortality, and gain in both feedlot and pasture receiving systems. A total of 2,264 steer calves from 3 buyers were assigned randomly to pens receiving one of three treatments with 12 replications per treatment. Seven reps were in a feedlot receiving system (20 steers/pen; 36 m^2/steer) and 5 reps were on cool-season pastures (88-152 steers/1.6-10.1 ha pasture). All calves received modified-live viral vaccine and *Haemophilus somnus* bacterin at initial processing and reprocessing. All calves received injectable anthelmintic at initial processing and 7-way *Clostridium spp.* bacterin-toxoid at reprocessing (median 18 d; d 16-27). Treatments included no antibiotic at arrival (CON), Excede (6.6 mg/kg BW) at arrival (ARR), or Excede (6.6 mg/kg BW) at revaccination (REVAC). Respiratory disease incidence and BW data were analyzed accounting for correlated observations of steer within pen. No differences ($P < 0.05$) of initial or final BW, or ADG were observed due to treatment. Initial BW, treatment, receiving system (pasture or feedlot), and buyer explained the cumulative incidence of respiratory disease for the study period ($P < 0.01$) in a generalized estimating equations logistic regression model. Cumulative incidence of BRD was 4.7 ± 1.1%, 11.0 ± 1.9%, and 13.8 ± 2.1% for ARR, CON, and REVAC, respectively. The ARR model-adjusted incidence of BRD was less than CON ($P < 0.01$). The model-adjusted incidence of BRD among REVAC steers was not significantly different from CON. Cumulative incidence of BRD was less ($P = 0.02$) for pasture receiving than feedlot receiving, 7.4 ± 1.1% and 11.0 ± 2.1% respectively. Most incidents of BRD occurred during the first 14 days of arrival and before the REVAC medication was administered. The ARR medication effectively improved animal health status by reducing BRD incidence.

Key Words: Respiratory disease, Antibiotic treatment, Feedlot cattle

529 Neural network modeling of feeding behavior to predict morbidity in a commercial feedlot. B. Hill*, K. Schwartzkopf-Genswein, T. McAllister, B. Genswein, A. Banack, R. Silasi, L. Thompson, and F. Brown, *Agriculture & Agri-Food Canada*, *Lethbridge, AB, Canada*.

Trials were conducted in 1998 and 2002 at a commercial feedlot near Amarillo, TX. The objective was to model feeding behavior to predict cattle morbidity with 75% accuracy 2-6 d ahead of a pen checker. Feeding behavior of newly-received calves was monitored for 107 d using the GrowSafe® system which uses radio frequency to record feedbunk attendance. Thirteen variables were collected: initial BW, d on feed (DOF), feeding duration and inter-meal interval (min., max., avg., SD and total; sec/d), feeding frequency (visits/d) and max. daily temperature. Neural network (NN) modeling was then applied to predict (classify) healthy and morbid animals on different d prior to morbid animals being pulled by a pen checker. Cattle were defined as morbid based on hospital diagnosis and drug treatment; healthy cattle as never pulled/treated. Data sets consisted of healthy and morbid animals (1:1 ratio matched by pen and DOF). In 1998, 60% of the morbid animals were pulled by 6 DOF; in 2002, 35% were pulled by 6 DOF. Animals that did not visit the feedbunk on a given d were excluded from data sets for that d. Individual feeding behaviors were highly variable and the NN typically required 6 to12 variables to classify the animals. For the 1998 trial, animals (n=104) were classified with 76% accuracy 2 d before animals were pulled. The most important variables were min. feeding duration, min. inter-meal interval and DOF. Classification accuracies were 74% at 4 d before pull (n=82), and 78% at 6 d before pull (n=66). Results were similar for the 2002 trial. Accuracies were 73% at 2 d before pull (n=220) with min. inter-meal interval, min. feeding duration, and total feeding duration as the most important variables. Accuracies were 75% at 4 d before pull (n=192), and 76% at 6 d before pull (n=124). In both trials, classification accuracies were similar for healthy and morbid animals and accuracies did not decline between 2 d and 6 d before pull. We are investigating whether accurate predictions can be made 7 to 10 d before pull. NN modeling shows good promise for predicting morbidity in feedlot animals.

Key Words: Feeding behavior, Neural networks, Predicting morbidity

530 Physiological, hematological and immunological responses of 9-month old bulls (250kg) to transport at spatial allowances of 0.85m^2 and 1.27m^2/animal on a 12-h journey by road. B. Earley*, D. J. Prendiville, and E. G. O'Riordan, *Teagasc*, *Grange, Beef Research Centre, Dunsany, Co. Meath, Ireland.*

To investigate the effects of space allowance during transportation on physiological, haematological and immunological responses in 9-month old bulls before and after a 12-hour road journey, bulls were randomly assigned to one of 3 treatments: 1) control (250kg ± 43.2s.d) (n=16); 2) transported at 0.85m^2/animal (250kg ± 20.1) (n=16); 3) transported at 1.27m^2/animal (249.2kg ± 18.8) (n=13) and transported by road on a 12 hour journey. Control bulls (250kg ± 43.3 s.d.) were housed on slats (2m^2/animal) and fed ad lib silage and 2 kg of concentrates at Grange Research Centre. Bulls were blood sampled immediately before and after transport. There was no change ($P \geq 0.05$) in liveweight, immunological responses (interferon-γ production) or in plasma concentrations of cortisol. Protein, globulin, urea and lactate concentrations and white blood cell numbers and the activities of the enzymes creatine kinase, aspartate aminotransferase and lactate dehydrogenase were not changed ($P \geq 0.05$) by transportation at either the 0.85 or 1.27 m^2 spatial allowances. Following transportation all transported groups had higher ($P \leq 0.05$) albumin levels than the control animals. Animals transported at a stocking density of 1.27m^2 had higher ($P \leq 0.05$) non-esterified fatty acid (NEFA) concentrations compared with controls. Post-transport, mean blood glucose concentrations were higher ($P \leq 0.05$) in all transported animals (0.85m^2 (5.01 ± 0.41 mmol/l); 1.27m^2 (4.79 ± 0.45 mmol/l) compared with controls (4.21 ± 0.28 mmol/l). The lymphocyte % were reduced ($P \leq 0.05$) at 0.85m^2 (40.8 ± 10.13) and 1.27m^2 (44.7 ± 8.84) compared with control animals (57.5 ± 10.9) post transport. Neutrophil numbers were increased ($P \leq 0.05$) in the transported animals at the 0.85m^2 (7.1 ± 2.6) and 1.27m^2 (6.0 ± 1.7) spatial allowances. It is concluded that there was no significant biological effects on the variables chosen of transporting bulls at a space allowance of 1.27m^2/animal compared with a spatial

allowance of 0.85 m^2.

Key Words: Transport, Welfare, Physiology

531 Gene expression changes in neutrophils of young bulls during transportation stress. K. R. Buckham*[1,2], J. L. Burton[3], B. Earley[2], and M. A. Crowe[1], [1]*University College Dublin*, *Dublin, Co. Dublin, Ireland*, [2]*Teagasc, Grange Beef Research Centre*, *Dunsany, Co. Meath, Ireland*, [3]*Michigan State University*, *East Lansing*.

The inevitable practice of transporting beef cattle results in a stress response that is associated with increased disease susceptibility to opportunistic respiratory pathogens. Other stress models have shown pronounced neutrophilia that correlates with an increase in blood glucocorticoids, implying that these stress steroids may impact innate immunity. The hypothesis of this study was that transport would alter expression of three genes known to be important for neutrophil-mediated immunity, including functions of transendothelial migration (CD62L and MMP-9) and apoptosis (Fas). To test this hypothesis, blood was collected, plasma harvested, and neutrophils isolated from 6 Belgian Blue bulls (231 ± 7.0 kg) at -24, 0, 4.5, 9.75, 14.25, 24, and 48 h relative to commencement of an 8 h transport by truck. Plasma cortisol concentrations, measured by RIA, were elevated at 4.5 and 9.75 h (50.64 ± 4.46 and 37.67 ± 4.15 ng/mL, respectively, ($P < 0.05$) compared to -24 h (22.15 ± 2.43 ng/mL), confirming that the animals were stressed by transport. Blood neutrophil counts were elevated between between 4.5 and 14.25 when compared to -24 h ($1.36 \times 10^6 \pm 5.9 \times 10^4$ cells/mL), reaching a peak of $1.73 \times 10^6 \pm 2.8 \times 10^4$ cells/mL at 9.75 h ($P < 0.01$). A weak positive correlation was observed between cortisol and neutrophil count (r = 0.25; P = 0.11). Neutrophil gene expressions for MMP-9 and Fas were also affected, although no difference in CD62L expression was detectable. Quantitative real-time RT-PCR analyses showed a ≥ 14-fold increase up-regulation of MMP-9 between 4.5 and 14.25 relative to -24 h ($P < 0.01$), while Fas expression was depressed about 2-fold during the same time period ($P < 0.05$). While these gene expression changes require validation at the protein level, our results suggest that transport stress may enhance pro-inflammatory activity of longer-lived circulating neutrophils, potentially compromising immunocompetence with the alteration of these cells' natural protective functions and contributing to disease severity during respiratory tract infections.

Key Words: Transportation stress, Neutrophil, Gene expression

532 Effects of lairage during transport on innate immune function of swine. J. L. Williams*[1,2], S. D. Eicher[1], J. A. Patterson[2], and J. N. Marchant-Forde[1], [1]*USDA-ARS*, *West Lafayette, IN*, [2]*Purdue University*, *West Lafayette, IN*.

Long distance transports may significantly affect the health of pigs; thus, adding a rest stop (lairage) during long journeys may improve their well-being. The objective of this study was to determine whether a mid-journey lairage was beneficial to swine immune variables during a 16-h transport. Four replications were conducted, one in each of four seasons. Eighteen-kg pigs were blocked by weight and assigned to one of two transport treatments. The pigs were housed in 16 pens (13-16 pigs/pen) with 8 pens/treatment. Lairage (La) pigs were transported for 8 h, given a rest with food and water for 8 h, then transported 8 h. Continuous (Co) pigs were continuously transported for 16 h. Jugular blood samples were collected from 16 pigs (8/treatment) on d 1, 3, 7 and 14 post-transport. Hematocrit and white blood cell (WBC) counts were obtained and neutrophil cell functions (phagocytosis and oxidative burst) and phenotypic cell markers (CD14 and CD18) were analyzed using flow cytometry. There were no treatment by block interactions. In Co pigs, total WBC count was higher on d 1 than La pigs ($P < 0.001$). As expected, granulocyte count in Co pigs was higher than in La pigs on d 1 ($P < 0.001$); further, granulocyte count was lowest on d 3 in Co pigs ($P < 0.05$). In both treatments, lymphocyte count was lower on d 14 than on d 1 ($P < 0.05$). There were more cells expressing CD14 in Co pigs than La pigs on d 1 ($P < 0.05$). In addition, Co pigs on d 1 and 14 had the highest percentage of CD14 and CD18 positive cells ($P < 0.05$) and La pigs had the highest percentages of both on d 14 ($P < 0.05$). Percent phagocytosis was highest on d 7 in the Co pigs ($P < 0.05$); however, in both treatments oxidative burst was highest on d 7 ($P < 0.05$). In both treatments, CD18 percentage was lowest on d 0 ($P < 0.05$). This study indicates that extended transport without lairage alters immune functions which may cause greater susceptibility to pathogens. Partial funding of this study was provided by the National Pork Checkoff.

Key Words: Stress, Immune function, Transport

Beef Species

533 Relationship between residual feed intake and onset of puberty in Brangus heifers. P. A. Lancaster*[1], G. E. Carstens[1], D. W. Forrest[1], R. D. Randel[2], T. H. Welsh, Jr.[1], and T. D. A. Forbes[3], [1]*Texas A&M University*, *College Station*, [2]*Texas A&M University*, *Overton*, [3]*Texas A&M University*, *Uvalde*.

Objectives of this study were to examine relationships between residual feed intake (RFI) and onset of puberty and ultrasound estimates of carcass composition in growing, purebred heifers. Average (± SD) initial ages of Brangus heifers (Camp Cooley Ranch) used in this study were 225 ± 9 and 236 ± 11 d for years 1 (N = 114) and 2 (N = 115). Heifers were individually fed a roughage-based diet (ME = 2.2 Mcal/kg) using Calan-gate feeders, and BW and DMI were measured weekly for 70 d. RFI was calculated as the residual from the linear regression of DMI on mid-test $BW^{0.75}$ (MBW) and ADG. Ultrasound measures of 12th rib fat thickness (BF), longissimus muscle area (LMA), and percent intramuscular fat (IMF) were measured on d 0 and 70. Progesterone analyses of weekly blood samples were used to determine onset of puberty. Heifers exhibiting a progesterone concentration ≥ 2 ng/mL for one wk or ≥ 1 ng/mL for two consecutive wk were considered to be pubertal. Ovarian ultrasound performed on d 63 of each year's study was used to confirm pubertal heifers. Average (± SD) ADG, DMI and RFI were 0.90 ± 0.15 and 1.06 ± 0.16 kg/d, 9.1 ± 1.1 and 9.5 ± 1.0 kg/d, and 0.00 ± 0.75 and 0.00 ± 0.68 kg/d for year 1 and 2, respectively. RFI was phenotypically correlated ($P < 0.01$) with DMI (0.67) and feed conversion ratio (FCR; 0.56), but not ADG