cows were used to compare talking in a gentle voice, shouting and control. Cows showed no preference between talking in a gentle voice and control but chose control and talking in a gentle voice more often than shouting ($P<0.05$). The results of these experiments demonstrate that the y-maze is an empirically valid method to compare handling treatments. Cattle show no obvious preference for physical gentling but are sensitive to the quality of the voice used when moving them.

Key Words: Dairy cattle, Behavior, Handling

154 Use of remote bunk monitoring to record effects of breed, feeding regimen and weather on feeding behavior and growth performance of cattle. K. S. SchwartzkopfGenswein[1], D. J. Gibb*[2], R. Silasi[2], S. Atwood[2], and T. A. McAllister[2], [1]*Alberta Agriculture, Food and Rural Development, Lethbridge, AB,* [2]*Agriculture and Agri-Food Canada Research Centre, Lethbridge, AB.*

Thirty Charolais and 29 Holstein steers (432 ± 30 kg) were blocked by weight and breed and randomly assigned to four feedlot pens to study the effects of breed, feeding regimen and weather on feeding behavior and growth. The pens were equipped with radio frequency identification systems that monitored bunk attendance (time, frequency, and duration of visits) by individual animals. In four 21-d periods directly following adaptation to an 80% barley grain:20% barley silage diet, steers were fed to meet ad libitum intake (AL), restricted to 95% of DMI from the previous 21 d (RF), returned to AL, then restricted (RF) once again. Steers were weighed every 21 d for calculating growth parameters. Weather data (air temperature, AT; relative humidity, RH; barometric pressure, BP; and wind speed, WS) were recorded over the 84 d. Charolais steers made fewer visits to the bunk and spent less time there than Holsteins ($P < .0001$), but their ADG and feed efficiency (FE) were higher ($P < .0001$). Bunk visits were less frequent ($P < .0001$) and total daily attendance (TDA) was lower ($P < .0001$) with AL than with RF, irrespective of breed. Charolais and Holstein steers both had higher ($P < .0001$) ADG with AL than with RF, but this did not improve FE. Growth performance was better for Charolais than for Holstein steers on either feeding regimen. Highest TDA values were recorded for Charolais steers during AL ($P < .0001$), and lowest for Holsteins during RF ($P < .0001$). Weather effects varied with feeding regimen and breed. In terms of reduced TDA, Charolais steers were more sensitive than Holsteins ($P < .0001$) to changes in weather (AT, RH and BP), but this did not compromise growth performance. Long term data collection will be required to relate the impact of weather on feeding patterns of feedlot cattle over different seasons and in different geographic locations.

Key Words: Cattle, Behavior, Radio Frequency Identification (RFID)

155 New technology for remote identification and 3D localization of livestock. I. Halachmi*[1,2] and M. Braiman[1], [1]*InfoRay Technologies, Israel,* [2]*SAE Afikim, Israel.*

A novel high frequency range Radio Frequency Identification (RFID) based on passive transponders has been developed and evaluated. Compared with the current state-of-the-art technology on the market the new technology has the following additional features: · The reading distance is more than 40m · The 3D co-ordinations (x,y,z) are available · Up to 1000 tags can be read simultaneously · The uniqueness of the tag is ensured by measuring the behavior of the coded signal. These options can be available to the market at no extra cost compared to the current RFID systems. The 3D coordination of an object is new technology that has potential for tracking and tracing animals. In cooperation with leading research institutions in Europe (IMAG-DLO, Wageningen, Holland) and Israel (Volcani center, A.R.O) an experiment was conducted. The aim of the study was (1) test and report to the public on the potential of the new technology; (2) develop a solution for the attachment of the electronic device to the animal; and (3) develop livestock health and welfare monitoring tools. The experimental farm is located in Kefar Yehoshua (Israel), and the experiment period was September 99 to July 2000. This research is part of a large-scale EU research proposal that has been submitted to EC, Brussels (Belgium). The technology can warn owners that animals have left their intended location as well as enabling efficient and mobile identification of animals from a distance. The potential has been studied for cattle, pig and sheep. The results suggest that the new technology has the potential for (1) monitoring beef cattle activity behavior on pasture; (2) estrus detection in beef cattle as well as dairy cows; (3) cheaper identification in large milking parlors; (4) early detection of health problems; (5) early lameness detection; (6) security and rapid theft detection; (7) contaminated cubicle (mastitis) detection; (8) monitoring and control over food intake; (9) alerting for "sucking cows"; and (10) animal inventory and control throughout the food chain.

Key Words: RFID, Cow, Identification

ANIMAL HEALTH

156 Effect of immunization with ferric citrate receptor FecA from *Escherichia coli* on experimentally induced coliform mastitis. K. Takemura*, J. S. Hogan, and K. L. Smith, *Ohio Agricultural Research and Development Center, The Ohio State University, Wooster, OH.*

The effect of immunization with FecA on intramammary infection and clinical mastitis following intramammary challenge of cows with *E. coli* 727 was investigated. Twenty-one cows were assigned to 7 blocks of 3 cows based on expected parturition. Cows within block were randomly assigned to one of 3 treatments: 1) FecA immunization, 2) J5 immunization, and 3) unimmunized controls. Immunizations were: 1) subcutaneous injection at 14 d prior to drying off, 2) intramammary infusion at 7 d after drying off, and 3) subcutaneous injection at 28 d after drying off. Challenge was by infusion of approximately 50 cfu of *E. coli* 727 into one uninfected mammary gland between 13 and 31 d after parturition. Cows within block were challenged on the same day. FecA immunized cows had greater immunoglobulin (Ig) G titers in serum and in mammary secretion against FecA antigen at calving, immediately prior to challenge, and 7 d after challenge than J5 immunized and control cows. FecA immunization also increased IgG titers against whole-cell *E. coli* 727 antigen in serum and in mammary secretion at calving compared with other treatments. Serum IgM titers against FecA antigen were greater in FecA immunized cows than in other groups immediately prior to challenge. FecA immunized cows tended to have lower bacterial colony-forming units, shorter duration of bacterial isolation in milk from challenged quarters, and lower rectal temperature compared with J5 immunized and control cows. Milk SCC from challenged quarters were greater in FecA immunized cows than in J5 immunized cows at 6 h after challenge. Milk SCC were greater in FecA and J5 immunized cows at 168 h after challenge compared to control cows. Milk production and DMI did not differ among treatments. FecA immunized cows had reduced clinical severity in challenged quarters and shorter duration of clinical symptoms compared with J5 immunized and control cows. FecA was immunogenic in cows, and the antibody response was related to reduced clinical signs following experimental *E. coli* intramammary infections.

Key Words: Mastitis, Vaccine, FecA

157 Evaluation of the California mastitis test for screening dairy cows for intramammary infection at calving. J.M. Sargeant[1], K.E. Leslie*[2], J.E. Shirley[1], M.E. Sheffel[1], G.H. Lim[2], and B.J. Pulkrabek[1], [1]*Kansas State University, Manhattan,* [2]*University of Guelph, Ontario, Canada.*

Monitoring of the prevalence of subclinical intramammary infection status at calving, and the specific pathogens involved, allows producers to evaluate the effectiveness of dry cow programs. However, culturing milk of all cows at the time of calving can be expensive and has not been widely adopted by the dairy industry. California mastitis test(CMT)has not been recommended for use in recently fresh cows. The objective of the present study was to examine the use of CMT for selecting quarters in fresh cows for milk bacteriological examination. Cut-points for defining a positive CMT test and length of time post-calving were evaluated. The study group consisted of 81 cows calving at the Kansas State University research dairy herd, and 50 cows calving at the University of Guelph dairy research herds. Quarter milk samples were collected for standard bacteriological culture on days 1 and 3 post-calving. A positive quarter was defined as one with a bacterial mastitis pathogen present at either day 1 or day 3 post-calving. CMTs were performed at cow side on

each quarter at the morning milking on days 1-10 post-calving. Quarters were scored as negative, 1, 2, or 3, as per manufacturer's recommendations. The sensitivities (specificities) of CMT for identifying positive (negative) quarters were calculated for different CMT cut-points and on different days post-calving. Intramammary infections were present in 36% of quarters. Quarters with intramammary infection had a higher mean CMT score throughout the first 10 days post-calving. The sensitivity of CMT for identifying positive quarters was highest when a positive CMT was defined as a score of 1 or greater. Using this criterion, a maximum sensitivity of 56.5% was found when CMT testing was performed on the third day post-calving (specificity = 56.1%). However, the sensitivity and specificity of CMT on day 3 post-calving for identifying major pathogens were 73.5% and 54.2%, respectively. The sensitivities of the CMT test on day 3 post-calving for identifying quarters infected with E. coli, *Klebsiella, Staph. aureus*, and environmental *Streptococci* were 50, 80, 60, and 84%, respectively. Thus, CMT used on the third day post-calving can be a useful aid for selecting quarters for milk bacteriological testing, and should be considered as one component of a fresh cow monitoring program.

Key Words: Mastitis, Post-calving, California Mastitis Test

158 Transgenic mice that secrete lysostaphin into milk are resistant to mastitis caused by *Staphylococcus aureus*. D.E. Kerr*[1], K. Plaut[1], A.J. Bramley[1], K.D. Wells[2], K. Moore[2], and R.J. Wall[2], [1]*University of Vermont, Burlington,* [2]*USDA-ARS, Beltsville, MD.*

Our long-term goal is to generate transgenic dairy cattle with enhanced resistance to microbial infection of the mammary gland. This disease is common in the periparturient, lactating, and involuting mammary gland and costs the U.S. dairy industry approximately two billion dollars per year. *Staphylococcus aureus* accounts for about 30% of mastitis cases, and is often associated with chronic infection. Lysostaphin is a potent staphylolytic enzyme normally produced by *S. simulans*. Recently, we modified the bacterial lysostaphin gene such that a bioactive gene product can be produced and secreted by eukaryotic cells. We have now generated transgenic mice containing this gene under control of the 4.2 Kb ovine β-lactoglobulin (BLG) 5'-regulatory region (BLG-Lys). Three lines of these mice have now been evaluated. One line, designated the high line, produces approximately 1 mg/ml of modified lysostaphin in milk; the medium and low lines produce approximately 150 μg/ml and 75 μg/ml, respectively. A murine model of experimental mastitis produced by intramammary infusion of S. aureus (10^4 cfu/gland) has been used to evaluate the bacterial resistance of the BLG-Lys mice. Eleven controls, and 11 BLG-Lys mice have been challenged (4 high-, 3-medium, 4 low-line; 2 glands/mouse). All mice were euthanized 24 hours post-infusion. Infection was established in all control glands. In contrast, glands of the high-line mice were completely resistant to infection, as were 43% of glands from the medium and low lines. The amount of lysostaphin in the glands (high, 100.6 $\pm$ 19.4; medium 12.0 $\pm$ 2.2; low 3.0 $\pm$0.4 μg/gland) was related to the degree of infection. Further, 17 of 22 control glands were classified as severely infected ($>10^9$ cfu/gland), being accompanied by visible signs of infection such as viscous exudate surrounding the mammary glands. In marked contrast, the glands of transgenic mice never appeared to be infected. Thus, production of new antibacterial proteins by the mammary gland is a means to enhance mastitis resistance.

159 Tail docking dairy cattle. C.B. Tucker* and D.M. Weary, *University of British Columbia Vancouver, Canada.*

Tail docking dairy cattle is a management practice that is becoming increasingly popular among North American producers. The objective of our study was to assess two proposed benefits of tail docking: improved cow cleanliness and udder health. The study was carried out on a 500 cow commercial herd. The animals were housed together in a flushed, free-stall barn. Initially, half of the herd was docked, and all fresh animals joining the herd over the 60 day course of the study were also docked. Cow cleanliness was measured in two areas: the back, along the spine, and the side adjacent to the tail. Presence of debris in 5 X 17.5 cm grid with 14 squares was counted. Additionally, the quality of debris in the grid was scored on a scale of 0 (none) to 3 (thickly caked). Udder cleanliness was scored using the same scale (0-3) and by counting the number of teats with debris on them. Udder health was assessed by measuring SCC and the number of animals diagnosed as mastitic by the on-farm veterinarian. Cow cleanliness, as measured in the two locations, did not differ between docked and undocked animals ($p > 0.31$). Udder cleanliness also did not differ between treatments ($p > .0.47$). In addition, SCC and incidence of mastitis did not differ between docked and undocked cows ($p > 0.66$, $p > 0.1$ respectively). Analysis of a sub sample of 19 cows illustrated individual differences in cleanliness ($p < .05$ for 3 of 4 measures of cleanliness). The results indicate that there are no cleanliness or health benefits associated with docking, but other management procedures, based on a better understanding of the individual differences, may be useful in improving cow cleanliness.

Key Words: Tail docking, Cleanliness, Mastitis

160 Oxytocin as a means of improving wound healing. M. N. Collins*, T. H. Friend, and I. Tizard, *Texas A&M University, College Station.*

Oxytocin is a hormone with many diverse functions and has recently been demonstrated to improve wound healing of musculocutaneous flaps in rats. Thirty-eight goats were used in this experiment to investigate whether oxytocin improves healing of wounds sustained from mechanical removal of the horns followed by cauterization. The goats were randomly assigned and received one of three treatments immediately following dehorning: 0.5 mL oxytocin (20 USP/mL) applied topically once a day on the wound site for five days (n = 12); 0.5 mL oxytocin (20 USP/mL) injected subcutaneously in the axillary region once a day for five days (n = 13); 0.5 mL chlorobutanol (preservative used in oxytocin) injected subcutaneously in the axillary area once a day for five days (n = 13). Circumference of the wound was traced on a clear acetate sheet immediately following dehorning and then once a day for five days. Wound area was measured by computer planimetry using a digitizer. Percent improvement (regression of the wound) was calculated as the remaining percent of the initial 100%. A significant difference was found between the subcutaneous oxytocin treatment (77%) and the control treatment that received chlorobutanol subcutaneously (104%), P = 0.03. The topically applied oxytocin treatment (82%) was not significantly different from the control treatment (104%), P = 0.14 or the subcutaneous oxytocin treatment (77%), P = 0.66. The mechanism by which oxytocin improves wound healing may be due to mechanical, systemic, or cellular changes.

Key Words: wound, oxytocin, goat

161 The effect of orally administered Seramune® as a colostrum supplement on growth, IgG levels, weaning age, morbidity, and mortality in Holstein heifer calves. A. L. Skidmore*[1], W. J. Prokop[1], D. A. Braun[1], D. Myers[2], C. Wright[2], and N. Wohlgemuth[2], [1]*Attica Veterinary Associates, PC, Attica, New York,* [2]*Sera, Inc., Shawnee Mission, KS.*

The purpose of this study was to determine if small, economically viable doses of orally administered Bovine IgG would reduce morbidity when used as a colostrum supplement in newborn calves. Ninety-nine newborn Holstein heifer calves were treated at birth in a double-blind study. The treatment was 20 ml of concentrated bovine serum immunoglobulins, (IgG) or 20 ml of placebo (PLBO) mixed with first and second feeding of colostrum. The calves were housed at a conventional, well-managed commercial dairy and managed according to farm protocol. Colostrum quality was measured before feeding. Blood samples were taken before first and second feeding of colostrum, second day, 7-days post calving and at weaning. All calves were weighed at birth, day 2, day 7, weaning, and 1-day post weaning. All sick calf treatments and date of weaning or death were recorded. No significant differences were found between IgG and PLBO groups for the following parameters: colostrum quality (65.3 g/l and 70.7 g/l respectively); body weights at birth, day 2, day 7, weaning and 1-day post weaning; age at weaning; immunoglobulin levels for first colostrum feeding, day 2, day 7 and at weaning; and percent of calves that experienced illness (34.8% and 35.8% respectively). Due to a low incidence rate and small sample size mortality was not different between IgG and PLBO (2.2% and 5.7% respectively). A significant difference (P=0.003) between IgG and PLBO was noted in the number of sick calf days (26 d and 59 d respectively). In calves that received less than 100 total g of immunoglobulins at the first colostrum feeding, significantly (P=0.01) fewer sick calf days were noted between IgG and PLBO (2 d and 10 d respectively). In conclusion, small, economically

viable doses of Seramune® mixed with colostrum significantly decreased sick calf days.

Key Words: Colostrum, Calves, Health

162 Effect of rumenocentesis on health and productivity in dairy cows. H. Aceto*, A. J. Simeone, and J. D. Ferguson, *University of Pennsylvania School of Veterinary Medicine, Kennett Square*.

This study assessed effects of rumenocentesis on health and productivity. Subjects were 12 lactating Holstein cows matched by production (32.3-38.6 kg, 80-210 DIM) and randomly assigned to 4 groups of 3 cows each. At 7-d intervals over 21 d, cows received a sham (S; no abdominal penetration) or rumen (R) stick. Treatments were 3S; 1R/2S; 2R/1S; 3R. Group feed intake, milk production, rectal temperature and attitude were monitored daily. Left abdominal ultrasound (US) was performed twice weekly. Blood was collected weekly for measurement of haptoglobin, WBC and differential, and neutrophil oxidative function. A composite milk sample was analyzed weekly for fat, CP, MUN, and SNF by PA DHIA. On test day (TD) 1, group feed intake decreased by 23%. Milk production in S cows fell by 2.0 ± 0.9 kg (6.0%), whereas R caused a 5.1 ± 1.3 kg (15.3%) milk drop. Around TD 2, ambient temperatures were 35-38 °C with high humidity so R was superimposed on heat stress. Under these conditions, the fall in milk production seen in the herd (6.0 ± 0.4 kg, 17.9%) and in S cows (5.6 ± 0.6 kg, 15.7%) was similar, but in R cows milk drop was substantially higher (9.5 ± 1.8 kg, 28.1%). On TD 2, rectal temperatures in R cows (40.3 °C) were significantly elevated compared to S (39.5 °C). On other days, rectal temperatures in R and S cows were not markedly different. On TD 3, reduction in feed intake was less than on TD 1 and 2. Milk production did not decline after TD 3, but the post-heat stress rebound was slowed in R cows. US revealed abscesses in 7/12 cows. Deep abscesses formed after even one R. Superficial abscesses were seen only in 2 S cows. Rectal temperature, haptoglobin, WBC and neutrophil function were not helpful in identifying cows that developed abscesses. Milk composition was not different across groups. These findings suggest that rumenocentesis is not a benign procedure; it may lead to abscessation and causes a decrease in production (16%) that is compounded by heat stress (28%).

Key Words: Rumenocentesis, Milk production, Heat Stress

163 Johne's disease prevalence and transmission in an infected dairy herd. S.J. Wells*[1], R.H. Whitlock[2], and J.R. Stabel[3], [1]*University of Minnesota, St. Paul, MN,* [2]*University of Pennsylvania, Kennett Square,* [3]*USDA-Agricultural Research Service, Ames, PA*.

In a longitudinal study to evaluate the epidemiology of Johne's disease (paratuberculosis), fecal samples from all adult cows within an infected herd were initially sampled, followed one year later by sampling of all cattle within the herd every 4 months for a total of 6 sample visits. Fecal samples were cultured for detection of Mycobacterium paratuberculosis using sensitive double incubation methods. Initial results showed 12% of adult cows were culture positive, followed by whole herd prevalences of 17%, 28%, 15%, 15%, and 13% at later visits; overall 32% of cattle tested at least one time were culture positive at least once. Over the period of sampling, the prevalence of fecal shedding by age group was 0% from 0-4 months of age, 4% from 5-8 months, 2% from 9-12 months, 5% from 13-16 months, 17% from 17-20 months, 12% from 21-24 months, 21% from 25-28 months, 25% from 29-32 months, and 24% from 33-36 months. From univariate analysis and within the population of cattle whose dams were also tested (127 animals), dam fecal shedding status was not related to cattle fecal shedding status. Cattle born during November through April were at higher risk of infection compared to those born during May through October, though this risk varied by year of birth.

Key Words: Johne's disease, Paratuberculosis, Epidemiology

164 The influence of injectable copper on immune response to bovine respiratory disease and occurence of injection site blemishes. J.E. Rowntree*[1] and M.E. Boyd[2], [1]*Michigan State University, East Lansing,* [2]*Mississippi State University, Mississippi State*.

Cattle entering the feedlot are often co-mingled and undergo radical dietary changes. These changes and a suppressed immune system often lead to feedlot morbidity and mortality. While copper (Cu) plays an important role in immunity, the Cu status of the incoming cattle are unknown. Therefore, our objective was to determine the effect of injectable Cu on immune response to Bovine Respiratory Disease (BRD), growth traits, carcass traits and injection site blemishes. One hundred ninety six newly weaned and yearling steers were randomly assigned to receive (1) 2-ml Cu Glycinate injection or (2) no injection. All yearling steers (n=76) were purchased from local sale barns and grazed on pasture until 12 to 15 mo of age before the study was initiated at the South Mississippi Experiment Station. The remaining cattle were from 7 to 12 mo of age and were located at the Leveck Animal Research Center (n=40), or three cooperator herds located throughout Mississippi (n=30, n=20, n=30). These cattle were preconditioned and treated similarly across location. Steers were vaccinated for BRD. Approximately 30-d following the initial vaccinations, steers were given a modified live booster for the BRD complex. Jugular blood was taken prior to vaccination and again at 50-d post vaccination which was prior to shipping to Hitch Feeders, Garden City, KS. Enzyme linked immunosorbent assays for Bovine Viral Diarrhea (BVD), Infectious Bovine Rhinotracheitis (IBR), Bovine Respiratory Syncytial Virus (BRSV), Adeno Virus, Para Influenza (PI_3) were performed on serum. Immune responses for BVD, IBR, BRSV, PI_3, Adeno Virus and Mycoplasma Bovis did not differ between treatments. Yearling steers had higher immune responses for IBR and BVD $P < .05$ than younger calves. There were no differences in feedlot morbidity and mortality or ADG. Cattle were marketed 148-d, 174-d, 189-d and 209-d after entering the feedlot. Carcass data was collected and blemish scores were given based on occurence and severity. There were no differences for ribeye area, marbling score, backfat, or injection site blemish score.

Key Words: Copper, Feedlot, Carcass

165 The use of inactivated *Propionibacterium acnes* as an immunostimulant in off-site reared piglets compared to conventionally reared piglets. J.B. Morris*[1], D.H. Hellwig[1], and S.L. Krumpleman[1], *University of Arkansas, Fayetteville*.

168 weaned piglets (initial weight 5.8 Kg and 18± 3 d of age) were blocked by weight and assigned to one of two facilities. Facility one (n=96) was a typical commercial operation while facility two (n=76) was an off-site facility. Treatment was randomly assigned to pen within block. Commercially-available *Propionibacterium acnes* (Eqstim®) was injected IM (1mg/5.8 Kg). The control group received an IM saline injection. Piglets were bled prior to injection and then again at 1.5hr and 24hr to measure serum TNF-α and INF-γ response respectively. Average daily gain and average daily feed intake was calculated weekly. Health status was monitored throughout the trial, using pre-determined criteria, and a sub-sample of animals was sacrificed for evidence of subclinical disease. Piglets at the off-site facility were significantly heavier on day 7, 14, and 21 (P = 0.04, P=0.08, P=0.03) and average daily gain was significantly higher at the off-site facility on day 7 and day 21 (P=0.04, P=0.002). Average daily feed intake was significantly lower (P= 0.08) in the *P. acnes* treated group during the first 7 days. There were fewer animals treated for signs of respiratory or enteric problems at the off-site facility. The use of the *P. acnes* approached significance. Neither facility nor treatment showed any difference in sub-clinical disease.

Key Words: *Proprionibacterium acnes*, off-site reared piglets

166 Infection of weaned pigs with *Actinobacillus pleuropneumoniae* fails to alter circulating interleukin 1β, tumor necrosis factor α, and interferon γ. R. Balaji[1], K. J. Wright[1], J. L. Turner[1], C. M. Hill[1], S. S. Dritz[1], B. Fenwick[1], J. A. Carroll[2], M. E. Zannelli[3], L. A. Beausang[3], and J. E. Minton*[1], [1]*Kansas State University, Manhattan,* [2]*Animal Physiology Research Unit, Agricultural Research Service, USDA, Columbia, MO,* [3]*Endogen, Inc., Woburn, MA.*

Infectious processes have been modeled experimentally with bacterial lipopolysaccharide (LPS). However, febrile, anorectic, and neuroendocrine responses to LPS are limited to a few hours post-challenge. In contrast, in porcine models of bacterial infection, these responses expand into several days post-infection, suggesting that LPS challenge models have limitations for modeling bona fide infectious processes. The current study was designed to assess changes in systemic cytokines in pigs in response to *Actinobacillus pleuropneumoniae* (APP) infection. Weaned pigs were housed in individual pens with free access to feed and water. Jugular catheters were inserted nonsurgically into all pigs about 7 d prior to challenge. At infection, pigs were given 5 X 10^8 CFU APP intranasally (n=3), or a similar intranasal volume of sterile media (n=3). Serum was collected at frequent intervals from -12 to 24 h relative to infection, and later assayed for interleukin 1β (IL1), tumor necrosis factor α (TNF), and interferon γ (IFN) utilizing porcine specific ELISAs for each cytokine. Infection with APP failed to alter profiles of IL1 (P >.3), TNF (P >.5) and IFN (P >.5) in the 24 h post-infection. Concentrations of IL1 generally averaged between 30-70 pg/mL and TNF between 90-160 pg/mL for both treatments. All concentrations of IFN were below 20 pg/mL. We reported previously this APP model evoked a prolonged surge in serum cortisol, disrupted feed intake, and resulted in unmistakable clinical signs of disease in infected pigs. Thus, we conclude that this bacterial pneumonia model is not associated with changes in systemic IL1, TNF and IFN in weaned pigs.

Key Words: Pneumonia, Cytokines, Pigs

167 Insulin-like growth factor-1 (IGF-1) modulation of porcine lymphocyte function. C.T. Collier*[1], T.H. Welsh, Jr.[2], and J.C. Laurenz[1], [1]*Texas A&M University, Kingsville,* [2]*Texas A&M University, College Station.*

The role of IGF-1 in the growth of animals is well established. Recently, there has been considerable interest in the potential immunomodulatory role of IGF-1. The present study investigated the effect of recombinant human IGF-1 and the synthetic glucocorticoid, dexamethasone (DEX), on concanavalin A (ConA)-induced lymphoproliferation and immunoglobin (IgM) production by pig lymphocytes. Blood was obtained from male, crossbred pigs (n=3; 35 days of age) and lymphocytes obtained by density gradient centrifugation over Lymphoprep (Nycomed, Oslo, Norway). Lymphocytes were plated at 1 x 10^5 cells/ml in DME/F12 containing 10% fetal bovine serum, 2 mM L-glutamine,10 uM 2-mercaptoethanol, ConA (0 to 5 ug/ml), DEX (0 to 10^{-5}M) and/or IGF-1 (0 to 100 ng/ml). Cultures were incubated for 96h and lymphoproliferation determined using the Celltiter proliferation assay (Promega, Madison, WI). In replicate cultures, supernatants were removed and IgM production determined using an ELISA specific for pig IgM. As expected, ConA induced a dose-dependent increase (P<.05) in lymphoproliferation and IgM production with (maximum effects at 1.25 ug/ml). Although not effecting basal lymphoproliferation, DEX dose-dependently (P<.05) inhibited ConA-induced lymphoproliferation (maximal effects at 10^{-7} M). In contrast, DEX (10^{-7} M) inhibited (P<.05) IgM production by lymphocyte cultures at low ConA concentrations (0.6 ug/ml), but was unable to suppress IgM production at higher concentrations of ConA (1.25 ug/ml). IGF-1 induced a dose-dependent increase (P<.05) in both basal lymphoproliferation and in the presence of low concentrations of ConA (0.6 ug/ml), but was unable to enhance lymphoproliferation at maximal concentrations of ConA (1.25 ug/ml). Although unable to stimulate basal IgM production, IGF-1 induced a dose-dependent (P<.05) increase in IgM production in the presence of ConA. IGF-1 (50 ng/ml) also attenuated (P<.05) the suppressive effects of DEX (10^{-7} M) on both ConA-induced lymphoproliferation and IgM production. Collectively, these results demonstrate that IGF-1 can enhance lymphocyte function and reduce the suppressive effects of glucocorticoids, suggesting that IGF-1 may be beneficial to enhance immune function in pigs.

Key Words: Pig, Insulin-like growth factor-1, immunity

168 Levels of interleukin 6 mRNA in pigs infected with *Salmonella typhimurium*. R. Balaji, D. M. Grieger, K. J. Wright, S. S. Dritz, J. C. Nietfeld, and J. E. Minton*, *Kansas State University, Manhattan.*

Treatment of pigs with bacterial lipopolysaccharide (LPS) results in changes in proinflammatory cytokine secretion and cytokine gene expression. However, we have shown that infection of pigs with both *S. typhimurium* and *Actinobacillus pleuropneumoniae* provoke clinical signs of disease and changes in the adrenal axis in the absence of changes in systemic proinflammatory cytokines. In the current study, we evaluated interleukin 6 (IL6) steady state mRNA levels in pigs infected with 3 x 10^9 CFU *S. typhimurium*. Pigs were penned in groups of 3 or 4 with ad libitium access to feed and water. After an acclimation period, pigs were given sterile broth orally or 3X10^9 cfu *S. typhimurium* in 5 ml broth. Pigs were sacrificed at 6, 12, 24, and 48 h following treatment. At sacrifice, samples of spleen, thymus, liver, hypothalamus, and anterior pituitary were obtained from each animal. Total RNA was extracted from each sample and subjected to slot blot analyses. Membranes were probed for IL6, then stripped, and probed again for 28s ribosomal RNA as a control for loading. Radiographic films were subjected to densitometric analysis, and abundance of IL6 mRNA was determined relative to 28s ribosomal RNA. Generally, tissues from 2 to 4 animals/treatment were represented at each sacrifice time. Although IL6 mRNA could be detected in all tissues, infection with *S. typhimurium* did not affect IL6 mRNA abundance through 48 h post-treatment. It had been previously reported that natural resistance-associated macrophage protein 1 (NRAMP1) mRNA was upregulated in samples of liver from these same animals, clearly indicating immune activation by this enteric disease challenge. Thus, we conclude that, unlike treatment with LPS, challenge with *S. typhimurium* is not associated with marked changes in IL6 mRNA.

Key Words: Disease, Interleukin 6, Pigs

169 Canavanine-induced life-sparing effect less apparent for mice fed 15.7% protein diets. D.L. Brown*, *Cornell University, Ithaca, NY.*

Dietary administration of 1% canavanine had been shown to improve survival in female BALB/c mice consuming diets containing 23.4% protein (dry matter basis). In order to determine if this effect also obtains at more moderate dietary protein concentrations, 30 female BALB/c mice were fed a basal diet with 15.7% (dry matter basis) protein and another 30 were fed the same diet plus 1% canavanine. Neither mean (Control 873.2 d, Canavanine 870.0 d; SEM=34.2 d; P=0.949 from ANOVA) nor median (Control 902 d, Canavanine 884.5 d; P=0.9058 from Mann-Whitney) lifespans differed between groups. Although mean antinuclear antibody (ANA) titers did not differ between controls and canavanine treated mice at 833 days of age (19.84 vs 20.39 respectively; SEM=2.64; P=0.889 from ANOVA), one canavanine-treated mouse displayed an outlying ANA value denoting possible early sign of incipient autoimmune disease in that individual.

Key Words: Canavanine, Longevity, Protein

170 Chlorfenapyr residues in milk and tissues in dairy cows following application of ear tags containing chlorfenapyr. K.L. Simkins*[1], C.A. Hirschlein[1], and J.W. Higham[2], [1]*Fort Dodge Animal Health, Princeton, NJ,* [2]*American Cyanamid Company, Princeton, NJ.*

The objective of this study was to determine if there were any residues of chlorfenapyr in milk and tissues from dairy cows following the application of two ear tags containing 30% chlorfenapyr. Seven Holstein cows producing 27.4 to 40.6 kg milk daily were randomly assigned to either a nontreated control group (3 cows) or a treated group (4 cows) which received one ear tag containing 30% chlorfenapyr, an insecticide for controlling horn flies, in each ear. Milk samples for analysis of chlorfenapyr were collected prior to treatment and at 1,2,3,6,8,10,13,15,17,20,22, 24,27 and 29 days posttreatment (PT). Milk fat samples for chlorfenapyr analysis were obtained at 15 and 29 d PT. All animals were sacrificed at d 30 PT for collection of muscle, liver, kidney and body fat for chlorfenapyr analysis. All milk samlpes from all cows having two chlorfenapyr ear tags had <10 ppb chlorfenapyr, which was the limit of quantification (LOQ) of the assay method. Low chlorfenapyr residues (12 and 18 ppb) were apparent in milk fat from two of the four treated cows at d 15 PT;

chlorfenapyr residues in milk fat from these two cows decreased to <10 ppb and 10 ppb, respectively, at d 29 PT. The body fat from the same two cows contained 11 and 20 ppb chlorfenapyr, respectively, at d 30 PT. For the other two treated cows and all control cows, milk fat and body fat contained <10 ppb chlorfenapyr. In muscle, liver and kidney samples from all treated and control cows, chlorfenapyr residues were below the LOQ for the methods (<10 ppb in muscle; <50 ppb in liver and kidney). These results show that chlorfenapyr residues following the application of two 30% chlorfenapyr ear tags on cows are below the LOQ for the methods in milk, muscle, liver and kidney.

Key Words: Chlorfenapyr, Milk Residues, Tissue Residues

171 Evaluation of a lateral flow test device for the determination of Immunoglobulin G (IgG) in colostrum. J. K. McVicker*[1], G. C. Rouse[1], D. M. Barrantes[1], and T. E. Besser[2], [1]*Midland BioProducts Corporation,* [2]*Washington State University, Pullman.*

Although the assessment of colostrum quality can be determined by a variety of methods, those methods that specifically measure immunoglobulin G (IgG) are considered to be the most reliable. Radial immunodiffusion (RID) and turbidimetric immunoassay (TIA) are examples of methods that directly measure IgG, but these methods require long incubation periods or elaborate equipment, making them impractical as on-farm tests. Specific gravity measurement has been used as an on-farm test, but this method does not specifically measure any immune component. We have developed and evaluated a semi-quantitative, lateral flow test device capable of determining IgG concentration ranges in colostrum. The test device is specific for IgG, does not require refrigeration, and is not temperature dependent. In addition, the test is easy to use and results are produced in 20 minutes. The accuracy of the test device was evaluated with 100 colostrum samples representing a variety of dairy breeds. All of the colostrum samples were tested by three methods: (1) the lateral flow device, (2) turbidimeteric immunoassay, (3) and by radial immunodiffusion. The ability of the test device to accurately determine the IgG concentration of the colostrum indicates that it would be a useful method to quickly determine the quality of colostrum.

Key Words: Colostrum, Immunoglobulin G

172 IS *900* PCR assay for detection of *Mycobacterium avium subsp. paratuberculosis* from bulk tank milk. S. Pillai*[1], B. Jayarao[1], D. Wolfgang[1], D. Griswold[1], L. Hutchinson[1], C. Burns[1], and R. Whitlock[2], [1]*Pennsylvania State University, University Park,* [2]*University of Pennsylvania, Kennett Square.*

An Insertion Sequence *900* (IS *900*) PCR assay was standardized by inoculating raw bulk tank milk and Middlebrook's 7H9 (M7H9) broth with each of 4 American Type Culture Collection strains (ATCC 19698, ATCC 43544, ATCC 43545, ATCC 43015) of *M. paratuberculosis*. Milk samples were centrifuged at 1950 x g for 30 min, and pellets obtained were divided equally. One half of the pellet was used for IS *900* PCR. The other half was decontaminated in hexadecylpyridinium chloride (HPC, 0.75%) and cultured (0.15 ml) on 2 slants each of Herrold's egg yolk medium (HEYM). Simultaneously, 2 more HEYM slants were inoculated with M7H9 suspensions (0.15 ml) of *M. paratuberculosis*. All recovery and detection experiments were replicated 6 times. Under experimental conditions, IS *900* PCR assay could detect *M. paratuberculosis* as low as 10 cfu/ml (3/6 replicates) - 100 cfu/ml (6/6 replicates). Further, IS *900* PCR detected *M. paratuberculosis* in 5/8 farm bulk tank milk samples from herds with known clinical history of Johne's disease. Two out of the 5 samples positive by IS *900* PCR were also positive by culture for *M. paratuberculosis*. The results of this experimental study will be validated by examination of bulk tank samples from several herds in Pennsylvania.

Key Words: IS 900 PCR, *M. paratuberculosis*, bulk tank

173 Inhibition of enterotoxigenic *Escherichia coli* adhesion to porcine small intestinal mucus receptor by *Enterococcus faecium*. L.Z. Jin* and X. Zhao, *McGill University, Macdonald Campus, Quebec, Canada.*

The objective of this study was to investigate if a strain of *Enterococcus faecium* (EF) has the ability to inhibit the adhesion of enterotoxigenic *E. coli* (ETEC) K88ac and K88MB to the small intestinal mucus receptor of piglets. The inhibition of adhesion of ETEC K88 to mucus receptor was assessed as the percentage of radioactivity in the test relative to the control by using a radioactive assay. The result showed that EF significantly inhibited the adhesion of *E. coli* K88ac to the small intestinal mucus receptors in a dose dependent manner. Inhibition > 93% was observed using 10^9 CFU/ml or above of EF culture. The adhesion inhibiting effects of EF culture declined dramatically when the concentration of EF culture was 10^7 CFU/ml or less. The bacterial cells, supernatant or the original culture of EF were tested separately to identify which part was involved in the inhibition. It was found that the original EF culture had the highest inhibitory effect (>93%) against the adhesion of *E. coli*, followed by the supernatant (79%) and bacterial cells (62%). Neutralized EF culture or supernatant (from pH 4.0 to 7.0) still showed the inhibitory adhesion of *E. coli* K88ac and K88MB to the mucus receptor, but in a lesser degree when compared to their counterparts (93% vs 74% for culture; 79% vs 60% for supernatant). It can be concluded that *Enterococcus faecium* culture, washed cells or its supernatant inhibited the attachment of *E. coli* K88ac and K88MB to porcine small intestinal receptor in vitro. The inhibitory effect was not solely a pH effect and might be attributed to sterical hindrance of binding sites.

Key Words: Escherichia coli, procine intestinal mucus receptor, Enterococcus faecium

174 The immunological aspects of dystocia in cows and the newborn calves. R. Skrzypek* and I. Szelag, *Agricultural University, Poznan, Poland.*

Eighty-three Black and White cows and their newborn sucking calves were investigated in this study. Blood samples were taken from cows 7-8 weeks before the expected parturition and 18 hours after parturition, while their calves were sampled 24 hours and 5 days after birth. Blood serum was assayed for total protein, globulins and gammaglobulins. In the dystocial cows (N=10) sampled before parturition, concentration of all serum constituents was significantly higher than in the healthy cows (N=73); total protein by 16.9 g/l ($P \leq .001$), globulins by 10.1 g/l ($P \leq .05$) and gammaglobulins by 6.5 g/l ($P \leq .05$). Odds ratio (OR) estimates from the logistic regression analysis were also significant; OR=4.09 ($P \leq .01$) for total protein, OR=2.64 ($P \leq .05$) for globulins and OR=4.42 ($P \leq .05$) for gammaglobulins. After parturition, no significant differences in blood composition between dystocial and healthy cows as well as no significant OR estimates were found. Dystocia had also significant effects on blood constituents of the newborn calves. At first sampling (24 hours after birth), in this group of calves compared with calves born to the healthy cows there was a lower concentration of total protein by 17.8 g/l ($P \leq .01$), globulins by 13.5 g/l ($P \leq .01$) and gammaglobulins by 7.2 g/l ($P \leq .05$). Similar differences were found at the age of 5 days. It is concluded, that dystocia has a decreasing effect on passive immunity of the newborn calves and that the occurrence of this disorder can be predicted in cows by immunity tests performed 7 to 8 weeks before the term.

Key Words: Dairy cattle, Dystocia, Immunity

175 A comparison of techniques to measure rumen pH in lactating dairy cattle. T. Duffield[1], J. C. Plaizier*[1], R. Bagg[2], G. Vessie[2], P. Dick[2], and B. W. McBride[1], [1]*University of Guelph, Ontario, Canada,* [2]*Provel, Division of Eli Lilly Canada Inc., Guelph, Ontario, Canada.*

Subacute rumen acidosis (SARA) is thought to be a common condition in early lactation dairy cattle, however, diagnosis is difficult. There are currently only two techniques available for measuring rumen pH under field conditions. Sixteen rumen fistulated cows were sampled in four sites of the rumen (cranial ventral, caudal ventral, central, and cranial dorsal) with a rumen cannula. These samples were compared to samples obtained at the same time with rumenocentesis (RC) and with an oral rumen probe (OP) (first 200 ml - OP 1, after 200 ml discard - OP 2). Rumen fluid was obtained between 6 and 12 weeks of lactation. Samples were analyzed for pH, lactate, bicarbonate, sodium, potassium, and chloride.

OP samples had the highest pH values and the highest bicarbonate concentrations. RC samples had the lowest pH values and lowest bicarbonate concentrations. Small differences in electrolyte concentrations were noted between sites. The highest correlation of rumen pH was obtained

between RC and the cranial ventral rumen (r=0.47). When compared to samples obtained from the cranial ventral rumen, RC was highly sensitive (few false negatives), while OP samples were poorly sensitive . Both tests were moderately specific The most accurate field test (highest combined sensitivity and specificity) was RC (81%). Improved field tests are required for better diagnosis of SARA on-farm.

Fluid Variable	OP 1	OP 2	RC	Cranial Ventral Rumen	Caudal Ventral Rumen	Central Rumen	Cranial Dorsal Rumen
PH	6.53^{a}	6.44^{b}	6.09^{c}	6.42^{abd}	6.31^{d}	6.10^{c}	6.30^{d}
Lactate*	1.20^{a}	1.19^{a}	0.51^{b}	0.66^{c}	0.37^{d}	0.63^{bc}	$0.\ 63^{bc}$
Na*	100.5^{a}	97.1^{ab}	98.5^{a}	98.2^{ab}	93.4^{b}	91.7^{b}	96.6^{b}
K*	32.5^{ab}	32.8^{ab}	33.9^{ac}	33.6^{ac}	31.0^{b}	30.4^{ab}	30.6^{a}
Cl*	23.8^{a}	22.6^{b}	20.9^{bd}	21.6^{b}	18.8^{c}	19.2^{cd}	$1\ 9.8^{cd}$
HCO_3*	0.98^{a}	0.14^{b}	0.01^{c}	0.43^{ad}	0.03^{ce}	0.01^{c}	$0\ .11^{bde}$

Values having different letter superscripts within each row different at P<0.05.
*mmol/L.

Key Words: rumen pH, subacute rumen acidosis, rumenocentesis

176 Blood Cholinesterase activity of beef cattle in humid tropical areas. V. Pardio*[1], K. Waliszewski[2], M. Garcia[2], N. Ibarra[1], M. Rodriguez[1], T. Betancourt[1], and J. Alfaro[1], [1]*Universidad Veracruzana, Veracruz, Veracruz/Mexico,* [2]*Instituto Tecnologico de Veracruz, Veracruz, Veracruz/Mexico.*

The purpose of the study was to characterize normal whole blood, erythrocyte (RBC) and plasma Cholinesterase (ChEs) activity for healthy beef cattle produced in humid tropical areas exposed to organophosphate pesticides, since a public health hazard exists for ingestion of meat containing these chemicals. Twenty clinically normal male calves (*Box Taurus x Box indicus*) 6-8 months old were managed to control exposure to organophosphate compounds. Coumaphos (1 mg /kg bw) was sprayed to the experimental group (n=10) as a commercial formulation every 14 days during 6 months. Blood samples were collected from jugular vein from each animal prior to treatment and then once per month. ChE activity determination of whole blood, RBC and plasma was according to Ellman method. ChE and Acetylcholinesterase (AchE) activity was expressed as UI/mL. Sera Check (Bayer-6656) control serum was used. AchE was assayed with iso-OMPA. Results were analyzed by MANOVA with a L-Stat software validated with Minitab 10.5. General responses were statistically different (p=0.007) between the control and experimental groups and with the time (p=0.005). The mean ChE activity in the whole blood (4.23), RBC (28.00) and plasma (0.33) of the experimental group were significantly lower than the mean ChE activities of control group. The mean AChE activity in whole blood (1.74) and in plasma (0.11) of experimental animals were significantly lower than activities of control group. ChE activity in the RBC represented 83.1% of the whole blood ChE activity. Mean baseline ChE activity of 15.87 (whole blood), 77.31 (RBC) and 0.394 (plasma) was estimated for control group. ChE activity decreased 36.58% in RBC and plasma Ache was depressed 47.57%. Results indicate that administering Coumaphos at this dosis to cattle in tropical areas produces a significant inhibition in RBC ChE and plasma AChE activity when compared to baseline levels. RBC ChE inhibition could constitute an appropriate parameter for assessing exposure of cattle to ChE-inhibiting pesticides.

Key Words: Cholinesterases, Organophosphorus pesticides, Beef cattle

177 Blood Cholinesterase activity as an index of immunotoxicity of organophosphate pesticides in beef cattle. V. Pardio*[1], K. Waliszewski[2], M. Garcia[2], T. Sedas[3], A. Moreno[1], P. Cervantes[1], T. Betancourt[1], and J. Alfaro[1], [1]*Universidad Veracruzana, Veracruz Veracruz/Mexico,* [2]*Instituto Tecnologico de Veracruz, Veracruz Veracruz/Mexico,* [3]*Instituto Mexicano del Seguro Social, Veracruz Veracruz/Mexico.*

The aim of this study was to determine the possibility to use blood ChE inhibition as a biomarker of adverse immunotoxic effect in cattle since the accumulation of the physiological effects of frequent exposure to non-acute doses is important. Twenty clinically normal male calves (*Bos Taurus x Bos indicus*) 6-8 months old were managed to control exposure to organophosphate compounds. Coumaphos (1 mg /kg bw) was sprayed to the experimental group (n=10) as a commercial formulation every 14 days during 6 months. Blood samples were collected from jugular vein from each animal prior to treatment and then once per month. ChE activity determination of whole blood, erythrocyte (RBC) and plasma was according to Ellman method. Sera Check (Bayer-6656) control serum was used. Acetylcholinesterase (AChE) was assayed with iso-OMPA. White blood cell (WBC) counting was assayed with a Cell-Dyn 3500 flow cytometer with veterinary package. Results were analyzed by MANOVA with a L-Stat software validated with Minitab 10.5. Correlation between ChEs activities and WBC variables (neutrophils, eosinophils, basophils, lymphocytes and monocytes) was performed by linear regression. General responses were statistically different (p=0.007) between the control and experimental groups and with the time (p=0.005). Blood, RBC and plasma mean ChE and activities of experimental group were significantly lower than the control group. Blood and plasma mean AChE activities of experimental group were significantly lower. Mean absolute number of eosinophils of experimental group was significant higher and was correlated to the decreased whole blood (0.99), RBC (0.58) and plasma (0.73) AchE activities. Mean absolute number of lymphocytes of experimental group was correlated to the decreased whole blood (0.99) and erythrocyte (0.58) AchE activities and plasma (0.62) ChE activity. Results suggest that the exposure to the pesticide could induce significant increase in the number of blood eosinophils and could induce changes in WBC.

Key Words: Cholinesterases, Organophosphorus pesticides, White Blood Cells

178 Effects of β-hydroxybutyrate, non esterified fatty acids, and urea on Sardinian sheep lymphocyte proliferation. N. Lacetera*, U. Bernabucci, B. Ronchi, D. Scalia, O. Franci, and A. Nardone, *Istituto di Zootecnia.*

The study was undertaken to evaluate the effects of β-hydroxybutyrate (BHBA), non esterified fatty acids (NEFA), and urea (U), at physiological or supraphysiological concentrations (mimicking those occurring in normal ewes or in ewes affected by subclinical or clinical ketosis), on proliferation of sheep peripheral blood mononuclear cells (PBMC). Five non pregnant, non lactating, and non ketotic Sardinian ewes were utilized as blood donors. The PBMC were isolated by density gradient centrifugation, incubated with various concentrations of BHBA (0, 0.45, 0.9, 1.8, and 3.6 mmol/l), NEFA (0, 0.5, 1, and 2 mmol/l), and U (0, 5, 10,15, and 20 mmol/l), and stimulated with concanavalin A (2.5 μg/ml), or pokeweed mitogen (0.4 μg/ml). The mixture of NEFA was represented by C16:0 (30%), C16:1 (5%), C18:0 (15%), C18:1 (45%), and C18:2 (5%). Cell proliferation was quantitated by an ELISA assay based on the measurements of 5-bromo-2'-deoxyuridine incorporation during DNA synthesis. Under the present culture conditions, the PBMC proliferation was not affected by the addition of physiological or supraphysiological concentrations of BHBA or U. Conversely, the addition of NEFA to cell cultures was responsible, at each of the three concentrations tested, for almost complete suppression of the proliferative response to concanavalin A ($P \leq 0.0001$), and pokeweed mitogen ($P \leq 0.001$). Suppression of the proliferative response to mitogens ($P \leq 0.0001$) was also observed in cells incubated with combinations of physiological or supraphysiological concentrations of BHBA, NEFA and U. Results of the present study indicate that the increases of plasma NEFA, rather than the increases of plasma BHBA or U, might contribute to explain the impairment of the immune response reported for sheep affected by subclinical or clinical ketosis.

Key Words: Sheep, Ketosis, Lymphocyte Proliferation

179 A trivalent vaccine for the treatment of chronic *Staphylococcus aureus* mastitis. P. Sears[1], A.J. Guidry*[2], A. Fattom[3], S. Shepherd[3], and C.N. O'Brien[2], [1]*Michigan State University, East Lansing,* [2]*Immunology and Disease Resistance Laboratory, ARS, USDA, Beltsville, MD,* [3]*Nabi, Rockville, MD.*

A trivalent vaccine for the treatment of chronic *Staphylococcus aureus* mastitis., P. Sears[1], A. J. Guidry[2], A. Fattom[3], S. Shepherd[3], and C.N. O'Brien[2], [1]1Michigan State University, East Lansing, MI, USA, [2]Immunology and Disease Resistance Laboratory, ARS, USDA, Beltsville, MD, USA, [3]Nabi, Rockville, MD, USA.
Previous studies reported that immunization of cows with an autogenous *Staphylococcus aureus* vaccine followed by antibiotic treatment cured 65% of quarters chronically infected with *S. aureus*. The current study was conducted in a similar manner using a trivalent vaccine (Nabi) that

contained *S. aureus* serotypes CP5, CP8, and 336, which account for 100% of *S. aureus* serotypes present in dairy herds in the United States and 96% of the serotypes present in European dairy herds. The vaccines contained either a killed autogenous *S. aureus*or the trivalent organisms in combination with aluminum hydroxide adjuvant, Selenium/Vit.E, and Vital E (Schering-Plough, Kenilworth, NJ). Cows diagnosed as having chronic *S. aureus* intramammary infections received three subcutaneous inoculations in the region of the supramammary lymph node at 0, 14 and 21 days after diagnosis of *S. aureus* intramammary infection. Cows also received six intramammary infusions of antibiotic at 1 to 2-day intervals beginning on day 14 after diagnosis of intramammary infection. Antibiotics alone cleared 1of 23 infected quarters (4%) and 0 of 12 cows (0%). The autogenous vaccine + antibiotic cleared 25 of 42 quarters (60%) and 11 of 20 cows (55%). The trivalent vaccine + antibiotic cleared 16 of 21 quarters (76%) and 7 of 13 cows (60%). The data suggest that the "universal" trivalent vaccine is as effective as autogenous vaccines. This would allow for treatment of cows chronically infected with *S. arueus* without the necessity of preparing a herd-specific vaccine, thus preventing culling of valuable animals. Studies are under way using the trivalent vaccine for the prevention of *S. aureus* intramammary infections.

Key Words: Trivalent vaccine, Stahpylococcus aureus, Mastitis

180 Effect of recombinant bovine soluble CD14 on CD18 expression of polymorphonuclear neutrophils in whole blood stimulated with lipopolysaccharide. Y. Wang*[1], D. Zarlenga[2], and M. J. Paape[2], [1] *University of Maryland, College Park,* [2] *IDRL, USDA/ARS, Beltsville.*

Three million cases of clinical mastitis caused by Gram-negative bacteria occurs every year in the U.S. A significant number of these cases will result in acute endotoxin shock and death. The major responsible factor for acute endotoxin shock is the lipopolysaccharide (LPS) in the outer membrane of Gram-negative bacteria. LPS binds to polymorphonuclear neutrophils (PMN), monocytes and macrophages, and induces releases of cytokines. Soluble CD14 (sCD14) neutralizes LPS and limits the release of pro-inflammatory cytokines. In the present study, a C-terminal truncated recombinant bovine CD14 (rbsCD14) was cloned into a baculovirus expression system. The rbsCD14 contained a six-histidine tag at the C-terminal end. The rbsCD14 was not detectable on the cell surface of sf-9 cell infected with recombinant virus, but was present in the culture supernatant of infected sf-9 cells. The rbsCD14 reached the highest concentration in the culture supernatant around 72 h. Typical yields averaged 4 mg rbsCD14/L of supernatant. The LPS-free rbsCD14 were purified sequentially using nickel-conjugated affinity column and polymoxin-B-sulfate affinity column. The functional activity of rbsCD14 was measured by its effect on CD18 expression of PMN in whole blood stimulated with LPS. Incubating blood (n=2) with LPS (100 ng/ml) increased the CD18 expression of PMN by 12% ($P < 0.02$). This increase was inhibited by pre-incubation of LPS with 10 and 100 μg/ml rbsCD14 ($P > 0.13$), but not by pre-incubation of LPS with 10 and 100 μg/ml bovine serum albumin ($P < 0.003$). The changes in CD18 expression of PMN is a sensitive marker for activation of PMN by LPS. The results of this study indicated that rbsCD14 neutralized LPS and prevented activation of PMN. The rbsCD14 may have a role as potential adjuvants for the treatment of serious Gram-negative bacterial infections.

Key Words: recombinant bovine CD14, lipopolysaccharide, polymorphonuclear neutrophils

181 Hepatic metabolism of Ergot alkaloids in beef cattle by cytochrome P450. A. S. Moubarak* and C. F. Rosenkrans, Jr., *University of Arkansas, Fayetteville.*

Ergot alkaloids are considered to be a major factor in fescue toxicosis in farm animals, and the economical impacts have been well documented. Little is known about the metabolism and detoxification of ergot alkaloids in livestock. The objective of this study was to investigate the presence and involvement of cytochrome P450 3A (CYP3A) in the metabolism of ergot alkaloids in beef liver microsomes. We also describe a reverse-phase liquid chromatography procedure with fluorescence detection for determination of ergotamine metabolites. Liver microsomes were prepared from three steers (600 kg) grazing endophyte-infected tall fescue and also from male Sprague-Dawley rats (n = 4; 250 g) treated interperitoneally with dexamethasone (100 mg/kg in corn oil, for 4 d). Ergotamine metabolism was assayed in medium containing liver microsome and NADPH at 37°C for 30 min. Rats treated with dexamethasone (inducer of CYP3A) showed 90% increased CYP3A activity over control rats. Ergotamine was hydroxylated first by CYP3A to metabolites M1 and M2 (8-dihydroxy-derivatives). The metabolites M1 and M2 were then converted to M3 and M4 (8,9-dihydroxy derivatives) by a second hydroxylation. Ergotamine isomer was hydroxylated in the same fashion as ergotamine to M1-Iso and M2-Iso. The formation of these metabolites was completely dependent on the presence of NADPH and was also microsome concentration dependent. Ergotamine was converted at a rate of 2 nM/μg microsome/min when incubated with bovine liver microsomes to produce a metabolite profile (M1, M2, M1-Iso and M2-Iso) similar (2.2 nM/μg/min) to the metabolites produced when ergotamine was incubated with liver microsomes of dexamethasone treated rats. This study shows that liver microsomes from beef animals grazing endophyte-infected tall fescue contain an enzyme capable of metabolizing ergotamine to a relatively more hydrophilic derivative. This suggests the presence of the CYP3A enzyme system and indicates that cytochrome CYP3A is responsible for the metabolism of ergotamine in beef animals.

Key Words: Ergot Alkaloids, P450, Liver

182 Metabolic responses of dairy cows to various subcutaneously administered dosages of glucagon. S. L. Oren, G. Bobe, B. N. Ametaj, A. F. Irlbeck, D. C. Beitz, and J. W. Young*, *Iowa State University, Ames.*

Continuous intravenous infusions of glucagon at 10 mg/d for 14 d improves the lipid and carbohydrate status of fatty livers in dairy cows; however, practical use of glucagon to treat or prevent fatty liver is likely to involve subcutaneous implants. We tested three subcutaneous glucagon dosages (2.5, 5.0, and 10.0 mg/d) on glucose, glucagon, and insulin in blood. Three cows were infused with each dosage of glucagon for 48 h in a 3 x 3 Latin Square with each cow being her own control, i.e., saline for 24 h before and after glucagon. Subcutaneous infusions of glucagon (SIG) caused plasma glucose to increase steadily for the first 8 h, especially with 5 and 10 mg/d. Average glucose concentrations remained elevated thereafter, but were greatest and most consistent for 5 mg/d. When SIG ended, glucose returned to baseline within 4 to 8 h. Plasma glucagon increased steadily and in a linear fashion for the first 8 h of SIG, and remained elevated during the 48-h infusions. The average increase was greatest for 5 mg/d (56/%) compared with the 10 mg/d (47/%) and 2.5 mg/d (31/%) dosages. Once SIG ended, glucagon returned to baseline within 2 h. Plasma insulin was not affected by SIG except for an increase with 10 mg/d dosage during the first 8 h of SIG. Milk protein percentages decreased with increasing dosages of infused glucagon, whereas the concentration of other milk components and milk production were not affected in a dose dependent manner. In summary, subcutaneous infusions of glucagon into dairy cows caused the same general effects on plasma glucose, glucagon, and insulin and on milk production that we had observed with intraveneous infusions. Therefore, practical administration of glucagon via subcutaneous implants for prevention or treatment of fatty liver is feasible in dairy cows. (Partly supported under CSREES-USDA agreement 99-35004-8576)

Key Words: Fatty Liver, Glucagon, Dairy Cows

183 Physiological responses of steers exposed to repeated sinusoidal heat challenge. M.J. Leonard*[1], D.E. Spiers[1], G.L. Hahn[2], K.J. Imhoff[1], and L.E. McVicker[1], [1] *University of Missouri, Columbia,* [2] *USDA-ARS, U.S. Meat Animal Research Center, Clay Center, NE.*

Summer heat stress continues to be a challenge to feedlot cattle production systems. Physiological indices are needed to predict thermal status of cattle and ultimately identify strategies to reduce stress. Twelve Angus x Simmental steers (Avg BW 419kg) were kept in environmental chambers and provided a typical finishing diet and water ad libitum. All steers were maintained in sinusoidal thermoneutral condition (TN; 19+/-7C°; 30-80% relative humidity) for 7 days. Air temperature (Ta) was then increased to a sinusoidal heat stress condition (HS; 33+/-7C°; 15-55% relative humidity) for 14 days. Thermal conditions were recorded continuously using data loggers (Onset Hobo), and included measurements of Ta and percent relative humidity (%RH). Temperature Humidity Index (THI) was calculated from these values. Steers were implanted intra-peritoneally with telemetric transmitters (Mini-Mitter, Inc.) to continuously monitor body core temperatures (Tcore). Skin

temperatures, respiration rates (RR), and rectal temperatures (Tre) were collected at 6am, 10am, 4pm, and 10pm daily. A second-order polynomial regression was the best fit for all relationships. Use of data from the 4 daily sample times showed that Ta was the best predictor for Tre (correlation coefficient(r)=0.64; P<0.0001), RR (r=0.78; P<0.0001), and skin temperatures (r=0.86-0.90; P<0.0001). Continuous Ta and Tcore data was used to improve prediction of Tcore. Simultaneous records showed Tcore relationships to Ta and THI of r=0.63 (P<0.0001) and r=0.75 (P<0.0001), respectively. Analysis was improved using a Tcore lag of 3 hours relative to Ta, with increased correlation coefficients of 0.80 and 0.88 (P<0.0001) for Ta and THI, respectively. These results show that it is possible to precisely predict thermal status of feedlot cattle using second-order polynomial regressions of ambient conditions.

Key Words: Cattle, Heat stress

184 Vitamin E supplementation in receiving diets: Effects on animal performance, medical treatment costs, and serum cholesterol concentrations. J.N. Carter*, D.R. Gill, T.C. Stovall, J.A. Shriver, B.A. Berry, W.T. Choat, A.W. Confer, R.A. Smith, and P.L. Claypool, *Oklahoma State University, Stillwater*.

Seven truckloads of shipping stressed calves (568 heifers, 197 ± 33 kg; 126 bulls and steers, 151 ± 11 kg) from Oklahoma and Texas auction barns were used to study the effects of adding 2000 I.U. of supplemental vitamin E (dl-a-tocopheryl acetate) for 0 (CON), 7 (E7), 14 (E14), or 28 (E28) days of a 42-day receiving period. Animals were blocked by weight into two classes (L=light; H=heavy) and randomly assigned to treatments within each class. Weights of each animal and whole blood samples from a subgroup in each class and treatment were obtained on d0, 14, 28, and 42. Serum was separated and frozen for later analysis of total serum cholesterol (SC) and serum vitamin E concentration (SE). Data were analyzed using GLM procedures of SAS; variables with statistical significance were further analyzed using MIXED. Regardless of treatment, average daily gain (.95 ± .36 kg/d) and feed conversion (F/G=5.3 ± 1.1) was not different, nor was performance different among weight classes (L vs H: ADG=.97 ± .35 kg/d vs .93 ± .36 kg/d; F/G=5.09 ± .31 vs 5.46 ± .31). The percentage of calves identified as sick and thus requiring treatment with anti-microbial drugs was 67.7, 68.3, 61.8, and 60.3 percent for the CON, E7, E14, and E28, respectively. Medical costs (COST) decreased (P>.05) from CON by 12.8, 15.6, and 21.4 percent for E7, E14, and E28, respectively. COST was also analyzed as a ratio of COST/total gain on feed and revealed a significant (P=.04) response advantage for H calves (L=$3.83 ± .03/100kg gain; H=$0.44 ± .03/100kg gain). SC decreased significantly in L and H from d0 to d14 (L= -61.7 ± 5.5 mg/dl, P<.0001; H= -75.6 ± 5.1 mg/dl, P<.0001). SC increased slightly from d14 to d28 (P>.05) in both L and H. A recovery of SC at d42 was observed over d14 and d28, but d42 SC was still significantly lower than SC at d0 in both L and H calves (L= -41.65 ± 5.6 mg/dl, P<.0001; H= -61.82 ± 5.1 mg/dl, P<.0001). Previous vitamin E research indicates that stress reduced SE in a pattern similar to that shown by SC in this study; analysis of SE for this study is in progress.

Key Words: Vitamin E, Medical Costs, Cholesterol

185 A model of fescue toxicosis: effect of exposure time to endophyte-infected diet. P. A. Eichen*, M. S. Eibs, D. E. Spiers, G. Rottinghaus, and K. Fritsche, *University of Missouri, Columbia*.

A model of fescue toxicosis has been developed where rats consume a diet of endophyte-infected fescue seed (EIF) for several days prior to exposure to heat stress. We propose that simultaneous exposure to this diet and heat stress will produce even greater symptoms of fescue toxicosis due to onset of dual stressors. Telemetric transmitters (Mini-Mitter, Inc.) were surgically implanted in twelve 50 day-old, male rats to continuously monitor core body temperature (Tc). Rats were housed at thermoneutrality (TN; 21°C) and fed a diet containing endophyte-free fescue seed (EFF). After two weeks equilibration, they were randomly assigned to either EIF or EFF diets, and simultaneously exposed to heat stress (HS; 31°C) for 23 days. EIF diets were formulated to deliver ergovaline, the toxin in EIF, at 160μg/kg BW/d. Body weight and feed intake were measured daily. Rats receiving EIF showed decreased feed intake (P<.0001) within one day of exposure to stressors, and decreased weight gains (P<.001) by day 3 of exposure. Average daily Tc was higher for EIF-fed rats (P<.0001) by day 2 of exposure to dual stressors. These rats also had higher average daily maximum Tc throughout, reaching a peak of 40°C on day 3 of exposure. Daily maximum Tc for EFF-fed rats (39.6°C) only occurred on days 3 and 15. The major difference between EIF and EFF groups was in maximum daily Tc. In a previous study, animals received EIF at TN, one week prior to HS. Reduction in feed intake occurred upon introduction of EIF, and equaled the reduction in the present study during HS. Weight gains were also immediately decreased with EIF. Significant EIF-induced hyperthermia did not occur until day 3 of HS, with maximum Tc on day 6 (39.9°C). As in the present study, this remained in effect for the duration of HS. These results suggest that administration of endophyte-infected fescue seed before, or in conjunction with heat stress, has similar effects on performance and thermoregulatory ability.

Key Words: Fescue Toxicosis, Heat Stress, Rat

186 Effect of simulated dust on serum antioxidant status and lipid peroxidation of market stressed steer calves protected with or without prophylactic antibiotic. N. K. Chirase*[1], L. W. Greene[1], J. Avampato[1], C. W. Purdy[2], E. F. Walborg, Jr.[3], Y. Xu[4], and J. E. Klaunig[4], [1] *Texas Agricultural Experiment Station, Amarillo,* [2] *USDA/ARS, Bushland, TX,* [3] *Dermigen, Inc., Smithville, TX,* [4] *Indiana University, Indianapolis*.

Oxidative stress results when production of reactive metabolites of oxygen exceeds their safe disposal by antioxidant mechanisms. This study was designed to measure the oxidative stress status of market stressed steers exposed to simulated dust. One hundred and five crossbred steers (average BW 207 kg) were purchased in Newport, TN and transported to Bushland, TX. The simulated dust storm was produced by having cattle in an enclosed canvas tent. One half of the calves received Micotil® (1 ml/30 kg of BW s.c.) at Bushland. Calves were allotted randomly into three dust treatment groups: 1) Control (not exposed to tent and dust), 2) Tent (exposed to tent without dust) and 3) Dust (exposed to dust suspension inside tent). There were four dust application events, each lasting 1 h. Calves were weighed and blood samples taken in Newport (d 3), arrival (d 0) and approximately every 7 d for 28 d. All serum samples were used to measure serum antioxidant capacity (TACA) and lipid peroxidation (malondialdehydes or MDA). The data were subjected to the analysis of variance using the General Linear Models procedure of SAS. There was no interaction (P>.05) between dust application and Micotil® for serum TACA or MDA concentrations. On d 1, serum TACA concentrations were greater (P<.001) for the control and tent groups than the dust group (4277, 4094 and 3506 IU/ml, respectively). Micotil® protected calves had greater (P.05) serum TACA concentrations than controls on d 1 and 28. Serum MDA concentrations for the dust group was greater (P<.05) than the control and tent (37 vs 19 and 36 mcg/ml, respectively). Serum MDA concentrations were lower (P<.02) in Micotil® protected calves than the controls (22 vs 39 mcg/ml, respectively). These data suggest that more research is required to understand the role of oxidative stress on feeder cattle health.

Key Words: Steer calves, Dust, Antioxidants

187 Effect of dehydroepiandrosterone and dehydroepiandrosterone-sulfate on lymphocyte function. S.C. Lozano*[1], T.H. Welsh, Jr.[2], and J.C. Laurenz[1], [1] *Texas A&M University, Kingsville,* [2] *Texas A&M University, College Station*.

Dehydroepiandosterone (DHEA) and its sulfate conjugate, DHEAS, are the most abundant circulating adrenal steroids in primates, although their exact biological function is not understood. It is known that DHEA and DHEAS concentrations decrease with age and that supplementation of DHEAS can modulate immune function. However, little is known about the potential role of DHEA and DHEAS in livestock. This study investigated the effects of DHEA, DHEAS, and a synthetic glucocorticoid (dexamethasone, DEX) on Concavalin A (ConA) induced lymphoproliferation and immunoglobin (IgM) production by pig lymphocytes. Blood was obtained from male, crossbred pigs (n=3, 60 days of age) and lymphocytes obtained by density gradient centrifugation. Lymphocytes were plated at 1 x 10^5 cells/ml in DME/F12 containing 10% FBS, 2mM glutamine, 10 uM 2-merceptoethanol , ConA (0 to 5 ug/ml), DHEAS (0 to 10^{-6}M), DHEA (10^{-6}) and/or DEX (10^{-8}M). Cultures were incubated for 96h and lymphoproliferation determined using the

Celltiter proliferation assay (Promega, Madison, WI). In replicate cultures, supernatants were removed and IgM production determined using an ELISA for pig IgM. ConA induced a dose-dependent increase (P<.05) in lymphoproliferation with maximal effects at 1.25 ug/ml. Although not effecting basal proliferation, DEX inhibited (P<.05) ConA-induced lymphoproliferation. In contrast, DEX inhibited (P<.05) IgM production at low ConA concentrations (0.6 ug/ml), but was unable to suppress IgM production at higher concentrations (1.25 ug/ml). Compared to studies in other species (mouse), DHEAS did not effect pig lymphocyte proliferation at any of the concentrations employed in this study. Similarly, DHEA (10^{-6}M) did not effect (P>.05) ConA-induced lymphoproliferation, IgM production or modulate the suppressive effects of DEX on lymphoproliferation. However, the addition of DHEA did reduce (P<.05) the suppressive effects of DEX on IgM production. These results indicate DHEA may be beneficial to reduce the suppressive effects of glucocorticoids on immune function. In addition, the ability of DHEA to modulate lymphocyte function combined with the apparent lack of activity of DHEAS supports the hypothesis that in vivo effects of DHEAS on lymphocyte function are dependent on sulfatase activity in other cells.

Key Words: Dehydroepiandrosterone, immunity, pig

188 Nitric oxide effects on rats fed an endophyte-infected seed diet. H. Al-Tamimi*, D. Spiers, and M. Ellerseick, *University of Missouri, Columbia*.

Fescue toxicosis impacts a wide sector of the livestock industry. Affected animals often experience increased hyperthermia during the summer. A major contributor to this problem is persistent peripheral vasoconstriction, which limits efficiency of heat loss from extremeties. Nitric oxide has an opposite effect on peripheral vasculature, and might reduce effects of endophyte-infected tall fescue (EIF). Adult, male rats (N=24; 12 per trial; avg. bwt =264.1±20.1) were randomly assigned to 4 treatment groups (2 x 2 factorial). All animals were maintained at thermoneutrality (21°C) for 4 days followed by 20 days exposure to heat stress (31°C). Treatment diets began after 5 days at 31°C. Endophyte-free diet was fed to control and nitric oxide donor animals (120mg molsidomine/ml drinking water; M). Similar groups were fed EIF diets at 160μg ergovaline/kg BW/day. Body weight, feed and water intakes were recorded daily. Core body temperature (Tcore) was monitored on an hourly basis using implanted telemetric transmitters (Mini-Mitter, Inc.). Serum was collected on the last day for blood profile analysis. Ingesting EIF increased Tcore at night (P<.07), and tended (P=.13) to raise it during the day compared to animals ingesting EIF-free diets. In contrast, M-treated animals had significantly (P=.0001) lower Tcore at night compared to M-free animals. Moreover, animals treated with combination of EIF and M had lower (P=.003) Tcore during the night than animals ingesting EIF alone. Feed intake of all animals decreased (P=.0001) at 31°C. Ingesting EIF caused a significant reduction in daily feed intake (P=.003), daily gain (P=.0001) and feed efficiency (P=.0001). Even though molsidomine had no effect (P>.47) on these three variables, it significantly (P<.02) reduced daily water intake compared to M-free treated animals. The EIF diet caused a significant reduction in serum cholesterol and amylase (P<.03) levels, as well as serum alkaline phosphatase (P<.07) and phosphorus (P<.05). Results from the current study confirms increased hyperthermia due to EIF-ingestion. It also suggests that nitric oxide has an alleviating-effect on heat stress. Further studies are needed to examine this effect on livestock.

Key Words: Fescue toxicosis, Rat, Nitric oxide

189 Role of energy balance in the ability of lactating cows to respond to a intramammary infusion of endotoxin. K. H. Perkins, J. S. Liesman, and M. J. VandeHaar*, *Michigan State University, East Lansing*.

Dairy cows are in negative energy balance (NEB) around the time of parturition. This may contribute to the increased incidence of infectious diseases such as mastitis observed at this time. We hypothesized that cows in negative energy balance (NEB), compared to those in positive energy balance (PEB), would be less able to respond to and recover from an experimentally induced inflammatory response. To test this hypothesis, primiparous Holstein cows in early lactation (81 to 123 DIM) were placed on a restricted diet (NEB; n=7) or fed ad libitum (PEB; n=7) for 2 weeks. The NEB cows were fed at 80% of their predicted energy requirement with feed intake adjusted every 3 d. During wk 2 of the study, cows in NEB consumed 13 kg DM / d and produced 28 kg of milk /d resulting in calculated EB of -9 Mcal/d. Cows in PEB consumed 22 kg DM per day and produced 33 kg of milk /d for a calculated EB of 4 Mcal/d. At the end of the 2-week period one mammary quarter of each cow was infused with 100 μg of lipopolysaccharide (endotoxin) to generate an inflammatory response. From 0 to 6 h post-infusion, blood leukocytes decreased from 10^7 / ml to 3 x 10^6 /ml and recovered within 24 h. From 0 to 12 h, milk somatic cells in the infused quarter increased from 10^5 / ml to 7 x 10^6 /ml and remained elevated for at least 48 h, indicating trafficking of leukocytes from the circulation into the infused quarter. Dietary treatment had no effect on blood or milk cell numbers. Body temperature increased to 40.5°C by 6 h for all cows and returned to normal within 24 h. However, the initial increase in body temperature and subsequent decrease was more rapid in the PEB than NEB cows (P = 0.03). Respiration and heart rate increased in response to the infusion, and the increase was greater for NEB cows. In addition, the respiration rate of PEB cows returned to normal more rapidly (P = 0.1). We suggest that cows in positive energy balance may be able to respond to and recover from an inflammatory agent more rapidly than those in negative energy balance.

Key Words: energy balance, inflammation, mastitis

BEEF SPECIES

190 Age of calf at weaning of spring-calving beef cows and the effect on cow and calf performance and production economics. R. J. Rasby*[1] and R. T. Clark[1], [1]*University of Nebraska, Lincoln*.

Over a 5-yr period, spring calving cows were used in a carry-over design experiment to evaluate effects of calf age at weaning on cow and calf performance and economics. Management groups were early (n = 60, calf age 150 d, EW), traditional (n = 60, calf age 210 d, NW), and late (n = 60, calf age 270 d, LW). Cow body condition score (BCS) and weight at the last weaning date were different (P < .05) for EW (5.8, 583 kg), NW (5.5, 560 kg), and LW (5.2, 541 kg) groups. Pregnancy rate among groups were similar. Days on feed for groups differed (P = .001) and was 247 for EW, 204 for NW, and 164 d for LW steers. Average daily gain in the feedlot differed (P = .01) among groups and averaged 1.5 kg for LW, 1.4 kg for NW, and 1.3 kg for EW steers. Hot carcass weight was greater (P = .01) for EW (328 kg) and NW (332 kg) steers compared to the LW (321 kg) steers and fat depth was greater (P = .05) for EW and NW compared to LW steers. Percentage grading at least USDA Choice was greater (P = .05) for the EW compared to NW and LW groups. When carcass data for the NW and LW steers were adjusted to the same fat depth of EW steers, carcass data among groups were similar. Net income per steer at slaughter was greater (P < .001) for the EW ($75.36) and NW ($62.16) steers compared to the LW ($10.09) steers. Adjusting the carcass data to similar a backfat reduced differences in net income. Replacement heifer costs were greater (P < .001) for the EW compared to NW and LW heifers. Annual cow costs were greater (P < .10) for the LW ($443.45) compared to the EW ($410.09) and NW ($421.35) groups. Breakeven for each system calculated on a steer financial basis was lowest for the NW and LW groups and greatest (P = .08) for the EW group. Age of the calf at weaning affects cow weight and BCS. Net income in each management system is influenced by cow costs, mo of the year and weight that steers calves are purchased into the feedlot and finished steers are sold, mo of the year cull cows are marketed, and replacement heifer development costs.

Key Words: Cow/calf Performance, Systems, Economics

191 The effects of age at weaning and prepubertal dietary management on performance of crossbred beef heifers. W. J. Sexten*, D. B. Faulkner, and F. A. Ireland, *University of Illinois, Urbana*.

Simmental×Angus spring-born heifers (n = 166) were utilized in a 2×2 factorial arrangement to evaluate age at weaning and prepuber-