

Wednesday, July 11, 2007  
POSTER PRESENTATIONS

**Animal Behavior & Well-Being - Livestock and Poultry III**

**W1 Laying hens in conventional and enriched cages.** G. B. Tactacan\*, J. D. House, and W. Guenther, *University of Manitoba, Winnipeg, MB, Canada.*

Concerns regarding the welfare of laying hens raised in battery cages have led to the development of enriched cages that allow hens to perform natural behaviors including nesting, roosting and scratching. This study was conducted to compare indices of production and welfare in birds housed in two different caging systems. Shaver White hens were housed from 21 to 45 weeks of age in either conventional battery cages (n = 500; 5 hens/cage; floor space = 87.1 in<sup>2</sup>/hen) or enriched cages (Hellman; n = 480; 24 hens/cage; floor space = 99.6 in<sup>2</sup>/hen). Enriched cages were provided with a nest, scratch pad and perches. Egg production, incidence of cracked, dirty or soft shelled eggs were recorded daily throughout the experiment. Feed consumption, egg weight and specific gravity were monitored at the end of every 28-d period. Plumage condition was evaluated on the neck, breast, back, tail, vent and wing regions at 35 weeks. Data were analyzed using t tests. The type of cage did not affect the hen-day egg production, feed consumption or egg weights. No significant differences were observed in specific gravity, percentage of cracked and soft shelled eggs between conventional and enriched cages, however, the incidence of dirty eggs was significantly higher (P < 0.05) in enriched cages (Enriched = 10.59% ± 2.95; Conventional = 3.78% ± 0.84). Plumage condition of the wings and back region of birds reared in the conventional cages were significantly higher (P < 0.05) and lower (P < 0.05), respectively, compared to birds reared in the enriched cages. All other body regions did not show significant differences. Overall, laying performance, egg quality measures and plumage condition appear to be similar for hens housed in the two cage systems tested.

**Key Words:** Laying Hen, Conventional, Enriched

**W2 Evaluation of weight shifting as a pain indicator in lame pigs.** L. Anil\*, S. S. Anil, J. Deen, S. V. Westen, and S. K. Baidoo, *University of Minnesota, St. Paul.*

Lameness is a putatively painful condition, common in pig farms. Generally, both pain and lameness in animals are assessed subjectively, often anthropomorphically. An objective measure to assess lameness

and the level of pain in lame pigs is necessary to evaluate pain alleviating interventions in lame pigs. The objective of the present study was to evaluate weight shifting as an objective indicator of pain in lame pigs. An analgesic was used in this study on the assumption that if analgesia could improve the condition it was pain that the animal was experiencing. This preliminary study involving 15 pigs was conducted at the swine research unit of the University of Minnesota at Waseca, MN. Visibly lame pigs were made to stand on slatted floor (12.7 cm solid portion and 2.54 cm slot) and on rubber mats (1.9 cm thickness) and number of weight shifting per minute was recorded. Subsequently the same pigs were treated with an analgesic (Flunixin meglumine 2.2 mg/kg body weight, intra-muscularly) and the number of weight shiftings per minute was recorded on both floor types 45 min after the injection. The measurements were repeated three times on alternate days with the same pigs during a continuous 5 days period. Within each floor type category the number of weight shifting before and after analgesic treatment were compared (Wilcoxon signed rank test). Similarly, the number of weight shifting before and after analgesic treatment was compared (Wilcoxon signed rank test) between floor types. The results indicated a higher (P ≤ 0.05) number of weight shifting on slatted floor prior to analgesic treatment compared to post analgesic treatment, whereas the number of weight shifting on rubber mat were similar before and after analgesic treatment. Both before and after analgesic treatment, the number of weight shifting was lower on rubber mat compared to slatted floor (P ≤ 0.05 for both). The study indicated that weight shifting may be considered as an objective indicator of the level of pain in lame pigs.

**Key Words:** Lameness, Pig, Pain

**W3 Development of a feed-restriction model to identify factors responsible for fescue toxicosis-induced reduction in food intake.** S. Raney\*, P. A. Eichen, and D. E. Spiers, *University of Missouri, Columbia.*

Fescue toxicosis is caused by consumption of ergopeptine alkaloids produced by an endophytic fungus (*Neotyphodium coenophialum*) in tall fescue, and is characterized by reduced productivity. The primary contributors to the reduced productivity are decreased feed intake and growth. There have been few attempts to characterize these changes in performance. A study was conducted to develop a model

for this component of fescue toxicosis using rats in a feed restriction experiment described previously by others. Each animal was trained over a minimum 11 d period to eat their entire daily ration from 1300 to 1500. The advantage of this approach is that one can effectively evaluate the effect of potential treatments more precisely over a 2-h period than over 24 h. Group I animals were first fed ad libitum an endophyte-free seed (E-) diet, then restricted E- diet, then restricted endophyte-infected seed (E+) diet, and lastly ad libitum E- diet. There was no significant decrease in feed intake ( $\alpha = 0.05$ ) from restricted E- diet to restricted E+ diet, but reduced growth while on E+ diet. Return to E- diet restored growth rate. A different routine was used with Group II. Rats were first fed ad libitum ground commercial diet, followed by restricted ground diet, then restricted E- diet, and lastly restricted E+ diet. Initial exposure to restricted diet decreased feed intake and growth rate ( $\alpha = 0.05$ ), followed by partial recovery or adaptation over the next 4 d. Shift to restricted E- produced no change in feed intake and a greater return of growth rate. Restricted E+ diet intake reduced feed intake and growth rate within 24 h ( $\alpha = 0.05$ ). This reduction was stable over the entire 2 week period. These responses agree with previous studies using long-term ad libitum E+ treatment. This new model can now be used to identify mechanisms for fescue toxicosis-induced reduction in feed intake and growth, and develop potential treatments.

**Key Words:** Fescue Toxicosis, Feed Intake, Rat

**W4 Assessing the performance of Redbro Cou Nu chickens in different environments.** W. L. Willis<sup>1</sup>, M. Johnson<sup>1</sup>, C. Hatcher\*<sup>1</sup>, and R. Joyce<sup>2</sup>, <sup>1</sup>North Carolina Agricultural and Technical State University, Greensboro, <sup>2</sup>Joyce Foods, Inc., Winston Salem, NC.

An experiment was conducted to evaluate feed type, placement time and density on the production performance of the Label Rouge chicken. Five hundred four day of hatch Redbro Cou Nu chickens were weighed, randomly assigned to two placement densities (1.0 sq ft vs 2.0 sq ft), replicated four times with 30 or 60 chicks per floor pen, with two pens for each density fed a convention or organic starter/grower diet for 9 wks, and two groups of 72 chicks housed for 3 or 6 wk for placement on pasture. Chicks were weighed weekly, mortality recorded daily, and feed consumption measured at the end of the trial. Body weights at 9 wks of age for the conventional feed and two placement densities were very similar (2.580 vs 2.540 kg) whereas, the organic chickens with more space had higher weights (2.720 vs 2.540 kg), respectively. Birds given 1 sq ft of space consumed less feed for both conventional and organic treatments. Chickens placed on pasture at 6 wks had higher body weights (2.373 vs 2.274) when compared to the 3 wk placed chickens. Mortality for the indoor chickens was similar and very low for both treatment groups. The chicks placed outside at three weeks suffered greater losses from hawks than the six wk placement group. The orientation of the house to the hawk's perch site is believed to have influenced the early placed chicks' susceptibility. The results from this study showed that not much production advantage is gained by the expensive organic feed and placement density indoors and placement time outdoors influence production parameters.

**Key Words:** Redbro Cou Nu Chickens, Placement Density, Organic Feed

**W5 The effect of mushroom and pokeweed extract on Salmonella in molting hens.** W. L. Willis\*, O. Isikhuemhen, I. Goktepe, M. Reed, and C. Murray, North Carolina Agricultural and Technical State University, Greensboro.

The present investigation was conducted to evaluate the effects of mushroom and pokeweed extract in the drinking water of leghorn laying hens during a 10 d molting period. The trial consisted of 54 Single Comb White Leghorn hens approximately 77 wks of age. The layers were subjected to one of nine treatment (trt) groups, replicated three times with two hens per replicate cage. The treatments consisted of 1) Full-fed + H2O; 2) Full-fed + mushroom; 3) Full-fed + pokeweed; 4) Non-fed molt + H2O; 5) Non-feed molt + mushroom; 6) Non-fed molt + pokeweed; 7) Full-fed alfalfa meal + H2O; 8) Full-fed alfalfa meal + mushroom and 9) Full-fed alfalfa meal + pokeweed. The pokeweed extract showed antimicrobial activity against *Salmonella* spp. in the crop ranging from 5-20 % of the initial control. Hens treated with crude pokeweed extract and no feed had the highest reduction in *Salmonella* spp. count. There was a reduction of *Salmonella* spp in alfalfa + mushroom (2.6 log 10) when compared to the non-fed + mushroom (2.8 log 10) and the Full-fed + H2O (2.9 log 10). The level of *Salmonella* spp. in the ceca of hens subjected to fasting exceeded 3.0 log10 in trt 4, whereas the alfalfa mushroom combination showed a lower level of 2.7 log 10. *Salmonella enteritidis* was isolated from the ovary and spleen (66%) in trts 2, 3, and 9, but not in the liver of any trt's. Egg production lagged behind more in trt's 8, 9 and 5, respectively, than any other treatments. No differences were noted in body or organ (liver, spleen, ovary) weight reduction between treatments. These results indicate that pokeweed and mushroom extracts exhibits antimicrobial activity against *Salmonella* spp. and such activity are expected to increase with higher concentration of extracts.

**Key Words:** Laying Hens, Molting, *Salmonella*

**W6 Control of feral hog populations: a domestic pig model to attract and repel feral hogs using odors.** N. Krebs, L. E. Hulbert\*, and J. J. McGlone, Texas Tech University, Lubbock.

Controlling feral hog populations is important to farmers and communities because of economic and health concerns. Traps work better if an attractive substance such as corn is present. The aim of this study was to determine which odors were attractive or repulsive to feral hogs, using a domestic pig model. Weaned pigs (n = 72) were exposed in a Y-maze for 6 consecutive days to 6 randomly assigned odor treatments: control (air, CON), maple syrup (MS), NH<sub>3</sub>, CORN, CO<sub>2</sub> and ChileGard™ (CHILE, habanero-based product). Twelve litter-replicates were used in this replicated latin square design (6 piglets/litter×6 treatments). Pigs were placed in a Y-maze (one arm contained nothing, the other the treatment) for one minute while video recorded. The time spent towards the treatment was divided by the total time spent in the right and left arms to express a Preference Index (PI, in %). The test day (TD)×treatment interaction was significant (P < 0.05). The data were analyzed per TD and compared to PI=50% (no preference). All means presented below were different (P < 0.05) than 50% (< 50% = aversion, > 50% = attraction). On TD 1, PI was more (P < 0.05) than 50 % (66.1 % ± 7.95) for CON, indicating a side preference. Pigs also preferred the odor of CORN (73.2 % ± 12.2).

All PIs were therefore compared to each TD's CON PI. On TD 2, pigs preferred NH<sub>3</sub> (72.3 % ± 10.7) or CHILE (69.8 % ± 11.0) compared to CON. On TD 3, the PI to NH<sub>3</sub> was 25.8 % ± 13.0 and 37.3 % ± 6.38 for CHILE, while on TD 4, the PI to CHILE was 76.3 % ± 14.1. On TD 6, pigs showed an aversion to NH<sub>3</sub> (32.6 % ± 14.0) and a preference for MS (75.2 % ± 10.7). These results may indicate that pigs were attracted to familiar odors (CORN and NH<sub>3</sub>) when in a novel testing environment. CHILE and NH<sub>3</sub> had variable effects. The PI to MS was superior to 50% only on TD 6; pigs may not have an innate preference to this novel odor. This domestic pig model must be tested in the field, but pigs were clearly attracted to a familiar feed odor (CORN) which may be useful in the field if pigs are first accustomed to the odor of corn. None of the odors tested were clearly aversive.

**Key Words:** Pigs, Feral Hogs, Odors

**W7 Adaptation of Angus steers to long-term heat stress in the field using controlled heat challenge.** B. Scharf\*, L. E. Wax, D. H. Keisler, and D. E. Spiers, *University of Missouri, Columbia*.

Most heat stress studies are conducted using short-term, controlled exposure (i.e., 1-2 weeks) in environmental chambers or long-term summer exposure to variable field environments. This study combines both situations by utilizing the controlled conditions in the Brody Environmental Center (BEC) at the University of Missouri to effectively provide each animal with an initial baseline 'stress test.' This was followed by placement in the summer field environment (South Farm, University of Missouri) for ~3 months, to create the long-term (i.e., real world) scenario, after which animals were given another 'stress test' to determine adaptive change. Six Angus steers (365 ± 10kg BW) were housed in the BEC for 7 days at air temperature (Ta) of 20°C (TN), followed by 7 days of cyclic heat stress (HS; Ta=26°C night; 36°C day). Respiration rate (RR) and rectal temperature (Tre) were measured 6 times daily. Sweat rate was measured at shaved sites (shoulder, rump) on select days. Following the initial test, steers were placed on pasture from May to September, 2006, when Ta and THI ranges were 7.0 - 38.1°C and 49.8 - 86.9, respectively. Pre-summer (PRE) Tre and RR were not different from post-summer (POS) values at TN (P > 0.09). Both groups increased Tre during HS (P < 0.0001), with POS animals stabilizing faster than PRE animals. In comparison with Tre response to HS, RR increased more rapidly, exhibited greater PRE to POS separation, and stabilized faster to suggest that it is a more sensitive measure of HS adaptation. Sweat rate rapidly increased prior to Tre and RR during HS (P < 0.0001), with PRE level rising above POS (P < 0.001) to indicate that sweat rate is a reliable indicator of short-term heat response and adaptation. However, sweat rate decreased in PRE steers to POS level after a few days, even though Tre and RR were still elevated. This suggests that reduction of sweat rate, and possibly water loss, is more important than reduction of body temperature during heat stress.

**Key Words:** Cattle, Heat Stress, Adaptation

**W8 Dietary supplementation with omega-3 fatty acids affects sexual behavior in boars.** M. J. Estienne\* and A. F. Harper, *Virginia Polytechnic Institute and State University, Suffolk*.

Enhancing semen quality and sexual behavior would increase efficiency in commercial boar studs. We reported (2007; *J. Anim. Sci.* 85[Suppl. 2]:20) that dietary supplementation with omega-3 fatty acids increased the number of spermatozoa by over 9 billion/ejaculate during a 16-wk trial. Here we report the effects of omega-3 fatty acids on sexual behavior. Yorkshire x Landrace boars, trained to mount an artificial sow, were fed 2.2 kg of a control diet (n = 12) or the control diet top-dressed with 0.3 kg of an omega-3 fatty acid supplement (JBS United, Inc., Sheridan, IN) (n = 12), daily for 16 wk. Semen was collected and libido assessed once weekly. Data were analyzed by ANOVA using a model that included treatment, period (Period 1 = wk 0 to 7 and Period 2 = wk 8 to 15), and treatment x period. The elapsed time from entering the collection pen until first interaction with the artificial sow was affected by period (15.4 sec and 8.6 sec for Periods 1 and 2, respectively; SE = 1.4; P = 0.04). There was a tendency (P = 0.09) for an effect of treatment x period for the interval between entering the collection pen and the first attempt to mount, and was 99.1 sec and 128.1 sec for controls, and 135.4 sec and 102.9 sec for boars fed omega-3 fatty acids, for Periods 1 and 2, respectively (SE = 17.4). Duration of ejaculation was affected by treatment (343.9 sec for controls and 388.8 sec for boars fed omega-3 fatty acids; SE = 7.2; P = 0.05). Elapsed time from entering the collection pen until the start of ejaculation (264.3 sec), and the number of false mounts (mounting the artificial sow but dismounting before a complete ejaculation was collected; 1.8) were not affected by treatment, period, or treatment x period (P > 0.1). Dietary supplementation with omega-3 fatty acids affected sexual behavior in boars by decreasing the time between entering the collection pen and first attempting to mount, and increasing the duration of ejaculation. (Funded by Virginia Agricultural Council)

**Key Words:** Boars, Sexual Behavior, Omega-3 Fatty Acids

**W9 Evaluation of physiological differences in heat tolerant (Romosinuano) and heat susceptible (Angus) Bos taurus cattle during controlled heat challenge.** B. Scharf\*, L. E. Wax<sup>1</sup>, J. A. Carroll<sup>2</sup>, D. G. Riley<sup>3</sup>, C. C. Chase Jr.<sup>3</sup>, S. W. Coleman<sup>3</sup>, D. H. Keisler<sup>1</sup>, and D. E. Spiers<sup>1</sup>, <sup>1</sup>University of Missouri, Columbia, <sup>2</sup>USDA-ARS, Livestock Issues Research Unit, Lubbock, TX, <sup>3</sup>USDA-ARS, SupTropical Agricultural Research Station, Brooksville, FL.

A study was performed to evaluate differences in thermoregulatory ability of two Bos taurus breeds with known differences in heat tolerance. Nine Angus (304 ± 7 Kg BW; AG) and nine Romosinuano steers (285 ± 7.5 Kg BW; RO) were housed in the Brody Environmental Center at the University of Missouri. Steers were housed for 14 d at thermoneutrality (21°C; TN) before initiation of heat stress. Heat stress (HS) consisted of daily cyclic air temperature (26°C night; 36°C day) for 14 d. Steers were fed a typical feedlot diet at 1.6% of BW/d. Rectal temperature and respiration rate were measured six times daily. Sweat rates were recorded on specific days throughout the study on shaved shoulder and rump sites. Analysis was repeated measure ANOVA. Respiration rate at TN was higher (P < 0.001) in AG than RO, by ~20 BPM. Angus steers maintained a higher rectal temperature (+0.5°C) than RO at TN (P < 0.0001). Sweat rates were also higher at TN (+6 g/m<sup>2</sup>/h; P < 0.03). Both breeds initially increased sweat rate 4-fold during HS (P < 0.0001), followed by reduction after 3 d (P < 0.0001). Sweat rate during HS was higher (P < 0.0001) in AG compared to RO by ~90 g/m<sup>2</sup>/h. Both breeds increased respiration rate by ~30 BPM during HS, with AG steers exhibiting the higher rate (P < 0.0001). Rectal temperature increased during HS for both breeds (P < 0.0001),

but was higher in **AG** breed ( $P < 0.001$ ). Romosinuano steers exhibit a lower sweat and respiratory rates than **AG** during HS, while maintaining the lower rectal temperature. Indices of heat loss used in

this study suggest that these avenues are not used to generate a lower rectal temperature seen in Romosinuano cattle during heat stress.

**Key Words:** Cattle, Heat, Tolerance

## Animal Health - Livestock and Poultry: Bovine II

**W10 Tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), nitric oxide (NO), and xanthine oxidase (XO) responses to endotoxin (LPS) challenge in steers: Effect of progesterone (P4) and estradiol (E2) treatment.** S. Kahl\* and T. H. Elsasser, *USDA, Agricultural Research Service, Beltsville, MD.*

The severity of host response in some diseases differs between sexes and this dimorphism has been attributed to the immunomodulating effects of steroid hormones. In females, prevailing P4 or E2 concentration during different estrous cycle phases have been suggested to affect the immune responses to a disease stress. Our objective was to determine in steers the effect of P4 or E2 treatment on circulating concentrations of immune response mediators after two consecutive LPS challenges (LPS1 and LPS2, 6 d apart; 2.5  $\mu\text{g}/\text{kg}$  BW, i.v., *E. coli* 055:B5). Plasma concentrations of inflammatory initiation cytokine TNF- $\alpha$ , nitrate+nitrite (NOx, estimate of NO production), and XO activity (mediator of superoxide production), were measured. Twenty crossbred steers ( $392 \pm 7$  kg) were fed a forage-concentrate diet (15% CP) to appetite and assigned to control (C, n = 7), P4 (n = 8) or E2 (n = 5) treatment. Progesterone (1 mg/kg BW; i.m.) and 17 $\beta$ -estradiol (E2, 2 mg/steer, i.m.) was injected 5, 3, and 1 d before LPS1 and LPS2. For each challenge, jugular blood samples were obtained at 0, 1, 2, 3, 4, 7, and 24 h relative to LPS injection. The primary response to LPS challenge was measured as area under the time  $\times$  concentration curve (AUC). Compared to C, P4 treatment decreased plasma TNF- $\alpha$  AUC after LPS1 (5.68 vs 8.15 ng/mL  $\times$  h,  $P = 0.08$ ) and NOx AUC after LPS2 (32.3 vs 131.2  $\mu\text{M} \times$  h,  $P < 0.05$ ). In contrast, E2 treatment augmented ( $P < 0.01$ ) plasma TNF- $\alpha$  (14.66 vs 5.96 ng/mL  $\times$  h) and NOx (299.8 vs 131.2  $\mu\text{M} \times$  h) responses to LPS2. Plasma XO AUC was increased ( $P < 0.01$ ) over C by E2 treatment after both LPS1 (406.8 vs 179.4 mU/mL  $\times$  h) and LPS2 (413.1 vs 156.5 mU/mL  $\times$  h). Results indicate that in cattle, circulating P4 and E2 may, respectively, attenuate or amplify the TNF- $\alpha$  response to LPS challenge as well as the subsequent responses of immune mediators (NO, XO) involved in oxidative damage to animal tissues.

**Key Words:** Endotoxin, Estradiol, Progesterone

**W11 Prevalence of *Chlamydophila* spp. in randomly selected dairy farms in the western part of Germany.** K. Kemmerling\*<sup>1</sup>, U. Mueller<sup>1</sup>, M. Mielenz<sup>1</sup>, K. Sachse<sup>2</sup>, J. Winkelmann<sup>3</sup>, F. Jaeger<sup>4</sup>, and H. Sauerwein<sup>1</sup>, <sup>1</sup>Institute of Animal Science, Physiology & Hygiene Group, University of Bonn, Germany, <sup>2</sup>Federal Research Institute for Animal Health, Jena, Germany, <sup>3</sup>North-Rhine-Westphalian Chamber of Agricultural Matters, Roleber, Germany, <sup>4</sup>North-Rhine-Westphalian Ministry of Environment, Conservation, Agriculture and Consumers Protection (MUNLV), Duesseldorf, Germany.

Infections with intracellular bacteria of the genus *Chlamydophila* are associated with various symptoms such as infertility in cattle. Serological studies suggested a high level of exposure to *Chlamydophila*

*spp.* but systematic epidemiological investigations for the DNA-based detection of *Chlamydophila* spp. are only scarcely available. The objective of our study was to characterize the prevalence of *Chlamydophila* spp. in dairy cows in the western part of Germany (North-Rhine-Westphalia) since the epidemiological status of dairy cattle infection with *Chlamydophila* spp. in North-Rhine-Westphalia (NRW) was unknown. In total 100 dairy farms were randomly selected. For this purpose the dairy cow stocking rate in the different administrative districts of NRW was taken into account. Ten dairy cows per farm or at least 10% of the stand density per farm were sampled. For the detection of *Chlamydophila* spp. vaginal swabs from non-pregnant, early lactating dairy cows were analysed using an established highly sensitive genus specific real-time PCR. At present, samples from 80 dairy farms i.e. from 870 individual dairy cows have been analysed. Positive testings were observed in 61% of the farms and in 15% of the cows. The lower prevalence observed on a per cow basis might be explained by the discontinued shedding of the pathogen. Nevertheless, our results suggest that *Chlamydophila* spp. is widely spread in NRW. To evaluate the impact of *Chlamydophila* infections on herd health and fertility and to develop strategies to counteract *Chlamydophila* associated health disturbances, further investigations are needed.

**Key Words:** *Chlamydophila*, Dairy Cows, PCR

**W12 Growth, health, and select immunologic and metabolic functions of preruminant calves housed in warm and cold environments.** B. J. Nonnecke\*<sup>1</sup>, R. L. Horst<sup>1</sup>, M. R. Foote<sup>2</sup>, B. L. Miller<sup>3</sup>, T. E. Johnson<sup>3</sup>, and M. Fowler<sup>3</sup>, <sup>1</sup>National Animal Disease Center, Ames, IA, <sup>2</sup>Iowa State University, Ames, <sup>3</sup>Land O'Lakes Research Farm, Webster City, IA.

The physiological response of the preruminant calf to cold-stress has not been studied extensively. This study examined effects of sustained environmental cold on growth performance and health of preruminant calves. Functional measures of energy metabolism, fat-soluble vitamin and mineral status, and immune competency were also evaluated. Holstein calves, 3 to 10d of age, were assigned randomly to warm or cold environments and kept in these environments for 7wk. Cold environment calves (n=15) were exposed to temperatures maintained as close to 2°C as possible. Frequent wetting of the environment and calves was used to augment effects of the cold environment. Warm environment calves (n=14) were maintained as close to 15°C as possible. Warm environment humidity was not manipulated. Preventative medications or vaccinations that might influence disease resistance were not administered. Non-medicated MR (20% CP and 20% fat fed at .45 kg/d) and calf starter (ad libitum) were fed to all calves. During the 7wk period, cold environment temperatures averaged almost 20°C lower ( $P \leq .05$ ) than warm environment temperatures. Relative humidity averaged 10% higher ( $P \leq .05$ ) in cold environment. Warm environment calves were healthier and needed less medical