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**SYMPOSIA AND ORAL SESSIONS**

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

**377 Cross ventilation in commercial livestock trailers shows promise for improving comfort, reducing weight loss and reducing environmental contaminants.** T. H. Friend\*, N. M. Giguere, and P. D. Krawczel, *Texas A&M University, College Station.*

A practical method of creating cross ventilation in commercial livestock trailers is being developed and evaluated. An initial series of trials determined traveling at highway speeds generated winds only ranging from 1 to 5.6 kmph in the commercial livestock trailers. Subsequent trials found that simulated environmental contaminants (smoke) could be cleared six times faster from a 5.2 × 2.4 m compartment of a semi trailer traveling 89 kmph using cross ventilation created by three externally mounted 12.5 × 10 cm (W × D) intake scoops facing forward, and another set of three exhaust scoops mounted on the opposite side of the trailer facing back. The efficacy of creating cross ventilation in the zone between the deck and the bodies of cattle was then investigated in two cool-weather trials, each with a ventilated and a control trailer transporting 80 calves to the same destination. Calves averaged 275 kg, came from the same source, and transport averaged 11.5 h in duration. Fifty-three 14 × 14 × 7 cm (L × W × D) scoops were mounted on the lowest set of two punches (25 cm above deck) on alternate panels (80 cm intervals) of every compartment in the ventilated trailer. The scoops on one side of the trailer were set as intakes while those on the opposite side were oriented to exhaust air. Temperature within the cross-ventilated trailer ranged from 0 to 4°C lower than in the control trailer, with the differential highly dependent on the speed and direction of prevailing winds. Ammonia concentrations averaged 35.5% lower in the ventilated trailer. Calves in the ventilated trailer had an average weight loss of 4.7% while calves in the control trailer lost 5.8%. Sodium concentrations were elevated ( $P > 0.05$ ) in the non-ventilated calves 8.5 h post transport indicating greater dehydration in the non-ventilated calves. Creating cross ventilation through the use of external air scoops has the potential to improve the well-being and health of livestock, and merits further research.

**Key Words:** Transportation, Ventilation, Cattle

**378 Genetic basis of different effects of chronic intermittent social stress on immune function and survivability in laying hens.** A. G. Fahey\*<sup>1,2</sup>, R. M. Marchant-Forde<sup>2</sup>, and H. W. Cheng<sup>2</sup>, <sup>1</sup>*Purdue University, West Lafayette, IN*, <sup>2</sup>*USDA-ARS, West Lafayette, IN*.

Chronic social stress has a large impact on animals' susceptibility to disease. This study was designed to examine the effects of genetic

selection and genotype-by-environmental interactions on chicken immune parameters and longevity. Chickens from HGPS (selected for high production and survivability, also called KGB, kind gentle birds previously) and DXL (Dekalb XL, a commercial strain) were used in this study. Chickens were housed in 8 bird cages (213 cm<sup>2</sup>/bird) from 34 - 45 wks of age. During the test period, two birds were moved between cages within the same genetic line to create a social instability called chronic intermittent social (CIS) stress. At 45 wks of age, blood samples were collected from the bronchial vein within two minutes after removing the chickens from their cages for immunological and corticosterone analysis from ten cages per line. Following euthanasia, body weight and several organ weights were measured. Results showed that DXL hens had a heavier adrenal weight (both absolute and relative weight) ( $P < 0.05$ ) than HGPS hens, while there were no differences in the body weight and weights of the spleens and livers between DXL and HGPS hens ( $P > 0.05$ ). Compared to the HGPS hens, DXL hens also had a higher portion of CD8<sup>+</sup> cells ( $P < 0.01$ ), resulting in a lower CD4<sup>+</sup>:CD8<sup>+</sup> ratio ( $P < 0.05$ ). There were no significant differences for plasma concentrations of corticosterone between the hens from DXL and HGPS lines ( $P > 0.05$ ). Results also showed that DXL hens had a higher mortality than HGPS hens ( $P < 0.01$ ). The data suggests that, compared to HGPS hens, chronic intermittent social stress may adversely affect the immune function and survivability of DXL hens. The results indicate that, similar to other animals, there are heritable components in chickens' disease resistance and stress response, which is regulated differently by genotype-by-environment interactions.

**Key Words:** Stress, Hens, Immune

**379 Different effects of individual identification systems on chicken well-being.** R. L. Dennis\*<sup>1,2</sup>, A. G. Fahey<sup>1,2</sup>, and H. W. Cheng<sup>1</sup>, <sup>1</sup>*Livestock Behavior Research Unit, USDA-ARS, West Lafayette, IN*, <sup>2</sup>*Purdue University, West Lafayette.*

Individual identification is a common method used in animal research. This study was designed to examine if various common identification systems, i.e., leg bands (LB), wing bands (WB), neck tags (ST), and livestock marker (LM), have different effects on hens' behavioral and physiological homeostasis. At 18 wk of age, hens were paired in all combinations of treatments and control (C, unmarked hens; n=10) in a novel cage for 5 trials of 1 hr each to test the effects of markers on social behaviors. Increased feather pecking (FP) was exhibited in WB hens compared with C hens ( $P < 0.10$ ) but not in LB, ST or LM hens ( $P > 0.10$ ). Increased FP in hens with WB may suggest an increase

in social stress and may lead to increased feather and body damage. No effect of identification treatment was evident on frequency of aggressive behaviors ( $P > 0.10$ ). At 20 wk of age, absolute fluctuating asymmetry (FA), but not relative FA, of shank length and width was more significant in LB hens ( $P < 0.05$ ), and tended to be significant in WB ( $P < 0.10$ ), but not in ST or LM hens, compared to C hens. Asymmetry of the shank is often a result of high stress levels, including social stress. Body weight (BW) measures at 20 wk showed hens with LB, but not WB, ST or LM, were significantly lighter than C hens ( $P < 0.05$ ), possibly as a result of decreased access to resources, increased metabolism or decreased appetite due to elevated stress. Increased FA and decreased BW are evidence of a disruption of the hens' physiological homeostasis due to increased stress. Leg banded hens also tended to have lower percent heterophil ( $P < 0.10$ ), indicative of increased stress and reduced immunocompetence. Our findings provide clear evidence of the negative effects of WB and LB systems on hens' well-being, altering both physiological and behavioral homeostasis, possibly leading to misinterpretation of experimental results.

**Key Words:** Identification System, Feather Pecking, Hen

**380 The relationship between residual feed intake and feeding behavior in growing heifers.** G. M. Bingham\*, T. H. Friend, G. E. Carstens, and P. A. Lancaster, *Texas A&M University, College Station.*

The objective of this study was to determine if feeding behavior is correlated with feed efficiency traits in growing heifers. Individual dry matter intake (DMI) was measured in Brangus heifers ( $n = 115$ ) fed a roughage-based diet ( $ME = 2.1$  Mcal/kg) for 70 d using Calan gate feeders (6 heifers/pen). Residual feed intake (RFI) was computed as the residuals from linear regression of DMI on mid-test  $BW^{0.75}$  and average daily gain (ADG), and heifers with the highest ( $n = 18$ ) and lowest ( $n = 18$ ) RFI were identified for feeding behavior measurements. During wk 5 through 8 of the 70-d feeding trial, continuous video recordings were obtained for all heifers. Video images for 2 sets of 4 24-h periods, 2 wk apart, were analyzed for the selected animals. All occurrences of feeding were timed and counted per day, and the 8 24-h periods averaged to derive mean head-down duration and meal frequency per heifer. Head-down duration (HD) was defined as the total min per day the animal's head was down in the feed bunk. A meal was defined as to include all visits an animal made to the feed bunk that were separated by less than 5 min. The resulting data were compared between the 2 groups analyzed using one-way ANOVA. Average RFI scores for low and high RFI heifers were  $-1.03$  and  $1.00 \pm 0.33$  kg/d. Low RFI heifers consumed 22.5% less ( $P < 0.001$ ) DMI, but had similar BW and ADG compared to high RFI heifers. Heifers with low RFI spent more time ( $P < .05$ ) eating ( $152$  vs  $124 \pm 10$  min/d), but had similar meal frequencies ( $14.78$  vs  $15.11 \pm 0.54$  meals/d) compared to high RFI heifers. Pearson correlation coefficients were used to determine the relationship between RFI and HD and meal frequency. There was a negative correlation ( $r = -0.39$ ,  $P < 0.05$ ) between RFI and HD, but meal frequency was not correlated with RFI ( $r = 0.05$ ). These data suggest that RFI is moderately correlated to HD but not meal frequency in growing calves.

**Key Words:** Residual Feed Intake, Feeding Behavior, Cattle

**381 The effect of the autosort system on swine behavior.** A. E. DeDecker\*, J. M. Suchomel, and J. L. Salak-Johnson, *University of Illinois, Urbana.*

Limited data exist on the impact that autosort, a relatively new, behavior-based production system has on pig well-being. The objective of this study was to examine the effect various autosort floor layouts have on the behavior and well-being of wean-to-finish pigs. At weaning,  $622 \pm 13$  pigs were randomly assigned to a water pen (WP; 20% floor space), food court (FC; 40% floor space), or fast lane (FL; 12.5% floor space per zone) autosort layout, or conventional large pen (CV). Behavior data was collected by live observations during a 3-week training period and at loading. Continuous video-records were used for scan sampling to determine the total number of animals performing a specific behavior at a specific time. Specific behaviors for loading and training were observed and recorded. Data were analyzed using Chi-Square and a MIXED procedure of SAS with repeated measures. During training the WC pigs went in and out of the scale at a faster rate than did FC or FL pigs ( $P \leq 0.05$ ). The FC pigs spent more time ( $P = 0.02$ ) engaged in aggressive encounters than did pigs in the FL. The FL pigs hesitated more ( $P = 0.03$ ) upon entering the scale than did pigs in the WC, whereas the FC pigs hesitated more ( $P = 0.03$ ) upon entering the scale compared with the FL pigs. The time spent eating or drinking and the number animals engaged in these behaviors at one time was significantly affected by treatment. For example, time spent eating among 1-5 pigs was greater ( $P \leq 0.05$ ) for the CV pigs than for the FC, WC, or FL pigs, whereas time spent eating among  $>10$  pigs was greater ( $P < 0.0001$ ) in FC layout than in the CV pens. Vocalization and prod use was greater ( $P \leq 0.01$ ) among CV pigs compared to WC, FC, or FL at loading. FC had a greater number of lame animals when being removed from the pen than did CV ( $P = 0.01$ ). The number of rears at loading were greater ( $P < 0.001$ ) for CV pigs than WC pigs. The CV pigs had greater difficulty loading onto the truck than did pigs from FL ( $P = .05$ ) and WC ( $P = 0.02$ ). These data indicate that autosort layouts can affect various behaviors, ease of handling, and loading throughout the wean-to-finish phase, thus using behavior to optimize these layouts is important.

**Key Words:** Autosort, Behavior, Well-being

**382 Movements of translocated desert mule deer in Sierra del Carmen, Coahuila, Mexico.** J. L. Martinez\* and L. A. Harveson, *Sul Ross State University, Alpine, TX.*

Population of desert mule deer (*Odocoileus hemionus crooki*) have shown declines in the past, to an extent where for several decades they were considered to be in danger of extirpation. The goal of this research is to restore population density of desert mule deer to the Sierra Maderas del Carmen of Mexico. Near 200 mule deer will be captured using net-guns and helicopter and transported to Sierra del Carmen. 40 to 50 deer will be randomly selected for our study and mortality sensitive radio-transmitters will be affixed to each mule deer, they will be monitored 3 to 5 times a week. Movements will be monitor to survey site fidelity and post release movements. Home range and movement rate comparisons will be made between seasons, sexes, and age classes. We are expecting 75% of the sample size to remain (site fidelity) within 15 kilometers from the release site. Mortality of radio-collared desert mule deer will be determined by mortality-sensitive transmitters, each mortality will be recorded and investigated. Habitat maps will be generated from black and white

and color infrared photographs or from concurrent SRSU research projects. Vegetation composition will be collected from transects. Species composition, canopy coverage, and other physical attributes will be used to describe habitats. Habitat preference will be determined using habitat selection ratios. Results from habitat analysis will identify key habitats relative to forage production, escape cover, and fawning habitat. The results of this study will aid future restoration efforts for desert mule deer. By the end of the study there will be a geographical representation of the habitats for mule deer of the Sierra del Carmen that will allow resource managers and landowners to establish realistic population objectives to minimize predator-specific mortalities, plus knowledge in the identification of crucial habitat for fawning, forage and escape habitat. Finally, this study will generate a management guideline for desert mule deer in Northern Mexico.

**Key Words:** Mule Deer, Site Fidelity, Maderas del Carmen

**383 Exercise increases bone density in the joints and limbs of gestating stall-housed gilts.** E. L. Schenck<sup>\*1</sup>, K. A. McMunn<sup>2</sup>, D. Rosenstein<sup>3</sup>, B. D. Nielsen<sup>3</sup>, B. T. Richert<sup>1</sup>, J. N. Marchant Forde<sup>2</sup>, and D. C. Lay Jr.<sup>2</sup>, <sup>1</sup>Purdue University, West Lafayette, IN, <sup>2</sup>USDA-ARS-MWA, West Lafayette, IN, <sup>3</sup>Michigan State University, East Lansing.

Lameness in breeding age gilts and sows is a major cause of early culling, causing increased economic losses and welfare concerns. Stall-housed sows tend to have more joint, foot and leg problems than group-housed sows. The aim of this study was to determine if exercise would decrease lameness, increase bone density, and increase muscle mass of gilts that were exercised versus not exercised during gestation. The study was composed of three treatment groups; control (C, n=8, no exercise), high exercise (H, n=5, 121.9 m 2 d/wk and 426.7 m for 3 d/wk) and low exercise (L, n=5, 121.9 m 5 d/ wk). All gilts were stall-housed for the duration of gestation and H and L gilts were exercised from d 35 to 110 of gestation. Blood was taken on d -14, 35, 56, and 110 of gestation and at the end of lactation via jugular venipuncture and collected serum was analyzed for osteocalcin by an enzyme immunoassay (EIA). At the end of lactation, sows were sacrificed and the left fore- and hind limbs were harvested. Specific muscles and bones from the fore and hind limbs were dissected out, weighed, and removed. Hooves were scored based on number and severity of lesions, cracks, and bruises. The patella and calcaneus bone density was determined by dual energy x-ray (DEX) scans. All other bone mineral density was determined by computed tomography (CT). Osteocalcin concentration in the L group was greater ( $P<0.05$ ) than C at d 35 and 56 and tended to be greater ( $P<0.1$ ) at d 110. There was no difference in hoof scores, muscle/body weight ratio, or in bone mineral density of the patella or calcaneus. Bone density (mg/cm<sup>3</sup>) was greater ( $P<0.05$ ) in the femur and the humerus of the L group compared to that of the C group and tended ( $P<0.1$ ) to be higher in the femur compared to the H group. The bone density of the radius of the H group was greater ( $P<0.05$ ) than both L and C groups. Scapular and proximal humerus articular cartilage scores of the L group were greater ( $P<0.05$ ) than both H and C groups. Exercise appears to increase bone density, however the relationship with exercise amount and intensity is not clear at this point.

**Key Words:** Swine, Lameness, Bone Strength

**384 Effects of pre-weaning strategies on blood metabolites, behavior, and performance of beef calves.** H. T. Boland<sup>\*1</sup>, G. Scaglia<sup>1</sup>, W. S. Swecker, Jr.<sup>2</sup>, and N. C. Burke<sup>2</sup>, <sup>1</sup>Virginia Polytechnic Institute and State University, Blacksburg, <sup>2</sup>Virginia-Maryland College of Veterinary Medicine, Blacksburg.

Traditionally, beef calves are abruptly weaned from their dams at 6 to 8 mo of age. Alternate weaning strategies have been suggested to reduce stress and improve performance of post-weaned calves. Two alternate weaning strategies were compared to abrupt weaning over a 2 yr period in spring-born, Angus-cross steers (yr 1, n=48; yr 2, n=54). Steers (IBW: yr 1=241 ± 5 kg, yr 2=242 ± 3 kg) were allotted to three treatments 7 d before weaning: fence-line (FL, separated from dam by a fence), nose clips (NC, placement of anti-suckling device and remained with dam), or control (CTRL, remained with dam and abruptly separated on d 0). On d 0, all steers were transported (170 km) away from their dams, held in a dry-lot with hay and water overnight, and placed in pastures on d 1. Steers were maintained in their pre-weaning treatment groups for a 42 d backgrounding period. Blood was collected by jugular venipuncture on d -7, 0, 1, 7, and 42. Serum was analyzed for NEFA, blood urea nitrogen (BUN), creatine kinase (CK), and glucose. Pedometers recorded steps/d for 7 d pre-weaning and 6 d post-weaning. Average daily gain was calculated from weights on d -7, 0, 1, 14, 28, and 42. Data were analyzed using PROC MIXED with Tukey's adjustment for means separation. Year was the repeated measure and paddock was the experimental unit. Model included year, day, treatment, and treatment x day interaction. There was a year effect for NEFA, BUN, and glucose ( $P<0.05$ ). Within CTRL and NC treatments, CK was highest ( $P<0.05$ ) on d 1, while FL steers had similar levels of CK on d -7 and 1. On d 0, NC steers had higher NEFA concentrations ( $P<0.05$ ) than FL or CTRL steers. Fence-line steers took more ( $P<0.05$ ) steps than NC steers on d -7 and -6. Over the 7 d pre-weaning period, NC calves took the least ( $P<0.05$ ) number of steps. Post-weaning, CTRL steers took more ( $P<0.05$ ) steps overall than FL or NC, due to more steps/d taken on d 1 and 6. Overall, ADG was lowest ( $P<0.05$ ) for NC calves. The use of nose-clips in this study did not seem to benefit calves while FL management may be less stressful than abrupt weaning.

**Key Words:** Stress, Weaning, Behavior

**385 Effect of stocking density on cow comfort indices.** P. D. Krawczel<sup>\*1,2</sup>, H. M. Dann<sup>1</sup>, C. S. Ballard<sup>1</sup>, and R. J. Grant<sup>1</sup>, <sup>1</sup>W.H. Miner Agricultural Research Institute, Chazy, NY, <sup>2</sup>The University of Vermont, Burlington.

The objective of this study was to evaluate the effect of stocking density (100, 113, 131, and 142%) on cow comfort index (CCI; # of cows lying in stalls (# of cows lying or standing within a stall)<sup>-1</sup> × 100), stall standing index (SSI; # of cows standing in stalls (# of cows lying or standing within a stall)<sup>-1</sup> × 100), and stall use index (SUI; # of cows lying in stalls (total # cows - # of cows eating)<sup>-1</sup> × 100) during a 24-h period, a 4-h peak lying period (0000 to 0400), and a 1-h period after milking. Holstein cows (n = 136) were assigned to 4 pens within a freestall barn in a 4 × 4 Latin square design. At 100% stocking density, a stall and headlock was provided for each cow and the greater densities were simulated by denying access to stalls and headlocks. Indices were calculated from video data recorded continuously for 2 d after 5 d of acclimation to each stocking density and analyzed with 10-min scan samples for the percentage of cows

lying in stalls, standing in stalls, standing in alleys, and feeding. During the 24-h period, treatment tended ( $P = 0.07$ ) to affect CCI and SSI; however, SUI decreased at higher stocking densities ( $P = 0.02$ ). Treatment effects were observed in CCI, SSI, and SUI between 0000 and 0400 ( $P < 0.05$ ). Treatment did not affect indices during the 1 h after milking ( $P > 0.1$ ). The increased percentage of cows standing in alleys at higher stocking densities ( $P < 0.001$ ) indicated reduced comfort, which was only incorporated into SUI. These results indicated that increased stocking densities affected cow comfort indices; SUI more accurately reflected cow comfort on a pen level at higher stocking densities; and measuring SUI during peak lying was recommended for an accurate assessment of comfort on a pen level.

**Table 1. Differences in CCI, SSI, SUI, and standing behavior at each stocking density during a 24-h period and between 0000 and 0400**

Time	Variable	100%	113%	131%	142%	SE
24 h	CCI, %	80.7	81.9	82.9	82.6	1.1
	SSI, %	19.3	18.1	17.0	17.3	1.1
	SUI, %	70.1 <sup>a</sup>	70.2 <sup>a</sup>	68.6 <sup>ab</sup>	66.3 <sup>b</sup>	1.2
	Standing, %	10.9 <sup>c</sup>	12.0 <sup>c</sup>	14.4 <sup>b</sup>	16.5 <sup>a</sup>	1.2
0000 to 0400	CCI, %	85.4 <sup>ab</sup>	86.7 <sup>a</sup>	86.3 <sup>ab</sup>	84.5 <sup>b</sup>	1.2
	SSI, %	14.6 <sup>ab</sup>	13.3 <sup>b</sup>	13.7 <sup>ab</sup>	15.6 <sup>a</sup>	1.2
	SUI, %	80.3 <sup>a</sup>	79.5 <sup>a</sup>	74.8 <sup>b</sup>	69.6 <sup>c</sup>	1.4
	Standing, %	5.3 <sup>d</sup>	7.4 <sup>c</sup>	11.6 <sup>b</sup>	15.3 <sup>a</sup>	0.5

<sup>abcd</sup>Values in each column without a common superscript differ ( $P \leq 0.05$ )

**Key Words:** Cow Comfort, Stocking Density, Behavior

### 386 Space requirements of weaned pigs during transportation.

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The space allowances provided to weaned pigs are based on professional experiences of producers. The objective of this research was to establish a first estimate of the space requirements of weaned pigs based on measures of animal well-being. A commercial semi-trailer was fit with compartments that provided 0.05, 0.06 and 0.07 square meters per pig ( $5.2 \pm 0.10$  kg) with a constant 100 pigs per compartment on both the upper and lower decks. The trailer was fit with HOBOS to record temperature, humidity and wind speed. Cameras were placed in each experimental compartment to record behavior of the pigs during transport. Prior to transport, blood samples were taken from 4 pigs per compartment for physiology and immune measures and weights and lesion scores were recorded. Pigs were then transported for 2 h to the wean-to-finishing site using the same route for each replication. At the finishing site, blood samples were taken from experimental pigs for physiological and immunological measures, weights, and lesion scores. This experiment was replicated 4 times during winter. Temperature

and humidity within the compartments were effected by an interaction between space allowance and deck ( $P < 0.001$ ). Cortisol, neutrophil to lymphocyte ratio and lesion scores were increased ( $P < 0.001$ ) during transport regardless of space allowance, deck or gender. Different space allowances during transport did not influence any performance or physiological measures measured in this study. Increased cortisol concentrations and neutrophil to lymphocyte ratio in transported weaned pigs suggests that these pigs experienced stress, however space allowances within the range of spaces tested did not appear to influence this response. In winter, space allowances of 0.05, 0.06 and 0.07 square meters per pig do not influence pig well-being as measured by body weight changes and physiological measures.

**Key Words:** Transport, Pigs, Animal Welfare

### 387 Behavior of beef calves weaned by traditional, fenceline and two-step methods.

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Traditional abrupt weaning of beef calves causes behavioral, physiological, and immunological stresses in calves which may persist for days to weeks. Non-abrupt weaning methods, such as fenceline and two-step weaning, may reduce weaning stress by simulating the natural weaning process by providing calves with maternal contact while nursing is prevented. The effects of three weaning methods on the behavior of calves were compared using direct observations and pedometers equipped with accelerometers and inclinometers. Over two years, 224 Angus-Simmental calves were evenly allocated by weight and sex into three treatments: 1) abrupt-weaned (AW); 2) fenceline-weaned (FW); and 3) two-step-weaned (TW). On day 0 (d 0) calves were prevented from nursing by removing AW dams to remote pastures, placing FW dams and calves across a fence, and fitting TW calves with a plastic nose flap. On d 5, TW and FW dams were moved to remote pastures. Instantaneous observations of behavior were performed each year on 10 calves per treatment every 20 minutes from 0900-1200 and 1400-1700 on d 1 and 6 after weaning. Pedometers recorded activity, standing, lying and number of steps from d 0-10. On d 1, AW calves stepped more, were observed walking more, and were more active ( $P < 0.01$ ) than FW and TW calves. On d 1, FW calves stepped more and were observed walking more ( $P < 0.01$ ) and were more active ( $P < 0.05$ ) than on subsequent days. On d 1, AW and FW calves grazed less than TW calves ( $P < 0.01$ ). AW calves vocalized more than TW ( $P < 0.01$ ) but not FW calves on d 1. More standing was observed on d 1 than on d 6 ( $P < 0.05$ ) but was not recorded by pedometers. Pedometers recorded less lying by AW on d 1 compared to lying by AW on other days. Data from observation and pedometers yielded similar results for active behaviors. However, results differed for standing and lying, likely because pedometers recorded over 24 h while observations were done during the day. Removal of dams on d 5 did not significantly affect behavior of FW and TW calves. Non-abrupt weaning appears less behaviorally stressful on calves.

**Key Words:** Calf, Stress, Pedometer