

all were exposed to aggression associated with grouping and feeder access. The data were analyzed using descriptive statistics, ANOVA and 2-sample proportion tests. The percentage of sows farrowed (82, 80 and 88 % respectively for D, TM and S groups) and removed (11.2, 7.4 and 8.7 % respectively for D, TM and S groups) were not different ( $P \geq 0.05$ ) among the housing systems. There was no difference ( $P \geq 0.05$ ) in farrowing performance in terms of number born alive, piglets weaned, stillborn, mummies, preweaning mortality, litter weights at birth and weaning, lactation length and wean to service interval. The grouping prior to implantation may be the reason for no difference in the reproductive performance of sows in different grouping treatments observed in this study.

**Key Words:** Electronic Sow Feeders, Group Structure, Farrowing Performance

**W8 Evaluation of the effect of group size and structure on welfare of gestating sows in pens with electronic sow feeders (ESFs).** L. Anil<sup>\*1</sup>, S. S. Anil<sup>1</sup>, J. Deen<sup>1</sup>, S. K. Baidoo<sup>2</sup>, and R. D. Walker<sup>2</sup>, <sup>1</sup>University of Minnesota, Saint Paul, <sup>2</sup>SROC, University of Minnesota, Waseca.

The welfare of 400 pregnant sows (GAP, English Belle; BW  $224 \pm 1.87$  kg; parities 0-7) housed in dynamic (D), 2-time mixing (TM) and static (S) groups of different group sizes in pens with ESF was evaluated to study the effect of group size and structure on welfare. The study was conducted at SROC, University of Minnesota. Four weaning batches of 20-30 sows were introduced at bi-weekly intervals to an existing group in a large pen ( $12.75 \times 13.5$  m, 2 ESFs) to form the D group. The TM group was formed by adding 2 batches to a pen ( $12.75 \times 6.75$  m, 1 ESF) at bi-weekly interval and 2 such pens were kept. A single batch of S group was housed in one half of a pen by regulating access to an ESF and 4 such groups were maintained. Behavior data and saliva samples were collected from 15 randomly identified sows from each newly added batch. Injuries of all sows were assessed. Saliva collection and injury level assessment were performed on the day before and after and 2 weeks after introduction. Behavior data were collected on the day, day after and 2 weeks after introduction. Data were analyzed using repeated measures of ANOVA and Spearman correlations. The weaning batch was considered as experimental unit. The D group had the highest ( $P < 0.05$ ) total injury scores (TIS). The cortisol and TIS were higher ( $P \leq 0.05$ ) at day after mixing than at 2 weeks post-mixing. The TIS was different ( $P \leq 0.05$ ) among the treatments at 2 weeks post-mixing with the D group having higher ( $P \leq 0.05$ ) score than the S. The number of queuing for access to ESF was higher ( $P \leq 0.05$ ) in the TM group. The number of non-agonistic social interaction was lower ( $P \leq 0.05$ ) in the D group ( $P \leq 0.01$ ). The proportion of time spent queuing was less ( $P \leq 0.01$ ) at mixing day among the treatments. Cortisol and TIS were positively correlated ( $P \leq 0.05$ ) in D and TM groups. Total aggression was positively correlated ( $P \leq 0.05$ ) with queue number and

duration in all groups. The higher TIS and lower number of non-agonistic social interactions indicated that the welfare of sows in the D group was compromised. Results on cortisol and TIS suggest that sow welfare is compromised by mixing, among the treatments.

**Key Words:** Sow Welfare, ESF

**W9 Effects of a modified farrowing pen on sow maternal behavior.** N. Devillers<sup>\*1</sup>, M.-C. Meunier-Salaün<sup>2</sup>, and C. Farmer<sup>1</sup>, <sup>1</sup>AAFC, Dairy and Swine R & D Centre, Lennoxville, QC, Canada, <sup>2</sup>INRA, UMR Système d'Élevage Nutrition Animale et Humaine, Saint Gilles, France.

A modified farrowing pen (MOD) designed as a standard farrowing crate (STD) with a 1.5 x 1.6 m pen in the back, equipped with rubber floor mats and accessible to sow and piglets was used to assess if more space and comfort favor sow-piglets interactions and nursing behavior. Primiparous Yorkshire x Landrace sows were randomly allocated between STD crates ( $n = 10$ ) or MOD pens ( $n = 13$ ). Litter size was standardized to 10 or 11. Direct observations of two successful nursings and one inter-nursing period (INP) were done between 12:00 and 18:00 on days 5 and 17 of lactation. Duration and interruption of nursing bouts, as well as localization, posture and activity of the sow and sow-piglets interactions during INP were recorded. Data were analyzed with SAS (MIXED procedure). In MOD pens, 74% of observed nursings occurred in the back pen. The total duration of nursing bouts was not affected by the pen type (MOD: 5.1 min, STD: 4.6 min,  $P = 0.1$ ), but the milk ejection phase was longer in MOD pens compared to STD pens (20.9 sec vs. 19.0 sec,  $P < 0.05$ ). Sows interrupted more nursings in MOD than in STD pens (42% vs. 15%,  $P < 0.05$ ). The duration of INP ranged from 16 to 73 min and did not differ between pen types ( $P = 0.9$ ). During INP, sows in MOD pens spent 80% of their time in the back pen, spent more time rooting (3.3% vs. 1.1%,  $P < 0.05$ ) and stood up and lay down more often (2.7 vs. 1.1 times/h,  $P < 0.05$ ) than sows in STD pens. Seventy percent of sow-piglets interactions occurred during the first half of INP. Sows in MOD pens tended to initiate more interactions with their piglets (26.4% vs. 14.8%,  $P = 0.08$ ) and showed more piglet-directed motor acts per interaction (2.1 vs. 1.6,  $P < 0.05$ ) than sows in STD pens. In conclusion, sows housed in MOD pens were more active and expressed more piglet-directed behaviors. This suggests enhanced welfare by enabling maternal behavior expression.

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**Key Words:** Farrowing Pen, Maternal Behavior, Nursing Behavior

## Animal Behavior and Well-Being: Swine Handling, Transportation and Stress

**W10 The fatigued pig syndrome.** M. Ritter<sup>\*1</sup>, M. Ellis<sup>1</sup>, M. Benjamin<sup>2</sup>, E. Berg<sup>3</sup>, P. DuBois<sup>4</sup>, J. Marchant-Forde<sup>5</sup>, A. Green<sup>6</sup>, P. Matzat<sup>7</sup>, P. Mormede<sup>8</sup>, T. Moyer<sup>9</sup>, K. Pfalzgraf<sup>10</sup>, M. Siemens<sup>11</sup>, J. Sterle<sup>12</sup>, T. Whiting<sup>13</sup>, B. Wolter<sup>14</sup>, <sup>1</sup>University of Illinois, Urbana, <sup>2</sup>ELANCO Animal Health, Canada, <sup>3</sup>University of Missouri, Columbia, <sup>4</sup>Cargill, KS, <sup>5</sup>USDA-ARS, IN, <sup>6</sup>USDA-APHIS, CO, <sup>7</sup>ELANCO Animal Health, MO, <sup>8</sup>Lab Neurogenetique et Stress, France, <sup>9</sup>Hatfield Quality Meats, PA, <sup>10</sup>Tyson Fresh Meats, AR, <sup>11</sup>Smithfield Foods, Inc., VA, <sup>12</sup>Texas A&M University, College Station, <sup>13</sup>Agriculture & Food, Canada, <sup>14</sup>The Maschhoffs, Carlyle, IL, <sup>15</sup>National Pork Board, IA.

A National Pork Board sponsored workshop reviewed the literature relating to fatigued pigs, defined as a non-ambulatory, non-injured animal that, without obvious injury, trauma, or disease, refuses to walk at any stage of the marketing channel from loading at the farm to stunning at the plant. Workshop objectives were to identify the causes and economic impact of this syndrome as well as factors potentially associated with fatigued pigs. Intervention strategies were reviewed and key gaps in the scientific literature identified. Potential mecha-

nisms for the etiology of this syndrome include acute stress resulting in acidosis and chronic stress resulting in glycogen depletion and physical exhaustion. Several studies have found elevated plasma ammonia concentrations in fatigued pigs, but the importance of this is not understood. Economic impact of the syndrome is currently unknown; national statistics for its incidence are not available and losses associated with product-quality defects (i.e., pork quality, carcass trim loss, and pig/carcass disposal costs) are not known. Field studies suggest that >50% of all non-ambulatory pigs at the plant are fatigued and, thus, it is anticipated that ~0.3% of all pigs transported will develop the syndrome. Predisposing factors for this multi-factorial syndrome were characterized as pig, environment/facility, people, transport, and plant. Key gaps in the literature included but were not limited to the effects of genetics, health status, increased leanness/muscling, age/slaughter weight, production system, trailer design, transport time, and plant line speed.

**Key Words:** Pig, Transport Losses, Fatigue

**W11 Welfare of finisher pigs during transportation to slaughter.** M. Ellis<sup>\*1</sup>, M. Ritter<sup>1</sup>, L. Ani<sup>2</sup>, D. Butler<sup>3</sup>, S. Curtis<sup>1</sup>, C. Dewey<sup>4</sup>, B. Driessen<sup>5</sup>, J. Hill<sup>6</sup>, J. Salak-Johnson<sup>1</sup>, J. McGlone<sup>7</sup>, C. Stull<sup>8</sup>, and A. Johnson<sup>9</sup>, <sup>1</sup>University of Illinois, Urbana, <sup>2</sup>University of Minnesota, St. Paul, <sup>3</sup>Murphy Brown Farms, LLC, NC, <sup>4</sup>University of Guelph, Ontario, <sup>5</sup>Zootechnical Centre, Belgium, <sup>6</sup>Premium Standard Farms, MO, <sup>7</sup>Texas Tech University, Lubbock, <sup>8</sup>University of California, Davis, <sup>9</sup>National Pork Board, IA.

An area of topical interest to the swine industry is the welfare of finisher pigs during transportation. The National Pork Board sponsored a transportation workshop which involved scientists, and government and industry representatives from North America and Europe to review the scientific literature, identify gaps in current knowledge, and identify future research needs. The review covered on-farm and transportation factors up to the point of unloading at the plant, and considered impacts on animal function and behavior as well as losses during transport. Inappropriate practices during transportation result in a significant cost to the industry in terms of pig losses, poor meat quality and overall swine welfare. At the farm, major factors impacting behavioral and physiological responses of the pig during transport include genetics, slaughter weight, environmental conditions (temperature and humidity), health status, marketing strategy, time off feed, pre-transport experiences, facility design, and nature of handling during loading. On the truck, major factors include truck design (e.g., pot-bellied vs. straight deck), location on truck, floor-space allowance, mixing of pigs from different groups, environmental conditions, and use of bedding. In addition, timing of events during transportation (loading, journey, and waiting times) and driving conditions (speed, rates of acceleration/deceleration, inclines, curves, and stops) are important factors. There has been limited research under typical North American conditions relating to pig welfare during transport, so considerable gaps exist in the knowledge base, particularly in relation to influences of pre-transportation factors on the pig's functional and behavioral responses to transportation.

**Key Words:** Pig, Transport, Welfare

**W12 Relationships between transport conditions and the incidence of dead and non-ambulatory finishing pigs at the slaughter plant.** M. J. Ritter<sup>\*1</sup>, M. Ellis<sup>1</sup>, J. Brinkmann<sup>2</sup>, K. K. Keffaber<sup>3</sup>, and B. F. Wolter<sup>2</sup>, <sup>1</sup>University of Illinois, Urbana, <sup>2</sup>The Maschhoffs, Carlyle, IL, <sup>3</sup>ELANCO Animal Health, Greenfield, IN.

Data on 74 loads of finishing pigs (mean BW = 129.0 ± 0.63 kg) from two finishing sites was collected over 4 seasons to evaluate the relationships between transport conditions and transport losses (dead and non-ambulatory pigs). Standard commercial procedures were used for pig handling and transportation. Pigs were loaded onto straight deck trailers, were mixed with unfamiliar pigs and were stocked at ~0.45 m<sup>2</sup>/pig. Average load weight, load number within day, event times (loading, wait at farm, transport, wait at plant, unloading, and total time) and temperature and relative humidity in the trailer were recorded. Relationships between transport conditions and losses were evaluated using Pearson correlations from the PROC CORR procedure of SAS. The incidence of non-ambulatory pigs at the farm and the plant were 0.26 and 0.85%, respectively, and 0.23% were dead on arrival at the plant. For 65 of the 74 loads, non-ambulatory pigs at the plant were classified as injured (0.24%) or non-injured (0.55%). Non-ambulatory pigs at the farm were positively correlated with relative humidity during loading and load number within day ( $r = 0.46$  and  $0.25$ , respectively;  $P < 0.05$ ). The incidence of plant non-ambulatory, non-injured pigs was positively related to waiting time at the farm, unloading time, and total time ( $r = 0.24$ ,  $0.41$ , and  $0.27$ ;  $P \leq 0.05$ ). The percentage of dead pigs at the plant was positively correlated to transport time, unloading time, and total time ( $r = 0.29$ ,  $0.52$ , and  $0.40$ ; respectively;  $P \leq 0.01$ ). The incidence of total plant losses was correlated with waiting time at the plant, unloading time, and total time ( $r = 0.24$ ,  $0.51$ , and  $0.36$ ;  $P < 0.05$ ). The percent of total plant non-ambulatory pigs was only related to unloading time ( $r = 0.32$ ;  $P = 0.01$ ), while none of the factors were related to plant non-ambulatory, injured pigs. Temperature in the trailer and average load weight were not related to losses. These data suggest that transport times and conditions may impact transport losses and this warrants further investigation.

**Key Words:** Pigs, Transport Losses, Transport Conditions

**W13 The effect of sire line, floor space allowance in the barn, and gender on handling characteristics and stress responses in finishing pigs.** M. J. Ritter<sup>\*1</sup>, M. Ellis<sup>1</sup>, C. R. Bertelsen<sup>1</sup>, J. Brinkmann<sup>2</sup>, B. A. Peterson<sup>1</sup>, J. M. Schlipf<sup>1</sup>, and B. F. Wolter<sup>2</sup>, <sup>1</sup>University of Illinois, Urbana, <sup>2</sup>The Maschhoffs, Carlyle, IL.

A total of 419 market weight pigs (Mean BW = 122.1 ± 1.86) were used in a completely randomized design with a 3 × 3 × 2 factorial arrangement of treatments to determine the effects of sire line, floor space allowance in the barn, and gender on handling characteristics and stress responses in finishing pigs during loading. The treatments were: 1) sire line (A=Pietrain ancestry, B=Hampshire, and C=Duroc), 2) floor space allowance (0.61, 0.68, and 0.74 m<sup>2</sup>/pig), and 3) gender (barrows and gilts). Pigs were moved from the pen to the truck in groups of 4-7 by two handlers. Handling interventions, time required to move, and a subjective handling score were recorded for each group. Rectal temperature and blood acid-base status were determined on 1 pig per group before and after handling. Before handling, gilts had lower ( $P < 0.01$ ) rectal temperature than barrows (39.26 vs. 39.57 ± 0.09°C, respectively). Also, there was a sire line by floor space interaction for before handling lactate ( $P < 0.01$ ; Line A = 2.17, 4.03, and 5.32; Line B = 3.27, 2.21, and 2.90; and Line C = 2.20, 5.13, and 3.91 ± 0.83 mmol/L, respectively for 0.61, 0.68 and 0.74 m<sup>2</sup>/pig). In general, sire line, floor space, and gender had little effect on handling interventions or scores. Immediately post-handling, gilts had higher ( $P < 0.05$ ) blood pH than barrows (7.39 and 7.33 ± 0.04, respectively), pigs from line B had lower ( $P < 0.05$ ) rectal temperature than pigs from line C (39.13 and 39.44 ± 0.29°C, respectively), and pigs from line A had higher ( $P < 0.05$ ) lactate than pigs from lines B and C (8.15, 5.67, and 5.97 ± 1.39 mmol/L, respectively for A, B, and C). Significant sire line by floor space by gender interactions existed ( $P \leq 0.05$ ) for post-handling HCO<sub>3</sub> and base excess. In summary, sire line differences existed for rectal temperature and lactate after handling. These data suggest that genetic lines may respond differently to handling.

**Key Words:** Pigs, Genetics, Handling

**W14 Heart rate associated with routine handling in finishing pigs and sows.** C. Lewis<sup>1,2</sup>, L. Hulbert<sup>\*1,2</sup>, and J. McGlone<sup>1,2</sup>, <sup>1</sup>Pork Industry Institute, Lubbock, TX, <sup>2</sup>Texas Tech University, Lubbock.

Routine husbandry requires that pigs be handled. Recommendations for use of certain handling devices should be based on the pigs reaction to these devices and methods. Exp. 1 examined the common pig handling devices for their effects on pig heart rate during a naive handling experience. The first device was an orange standard pig handling board. The second device was a cape consisting of red cloth that is folded into three sections, which can be formed in a u shape. The third device was a large red cloth flag extended on a pole. The fourth device was a standard blue paddle and a pole. The fifth device was an electric prod. The sixth moving method was the use of the board and the electric prod. The handling course involved 5 turns and movement through a narrow space. The narrow space was examined in a control setting and with a fan blowing room-temperature air towards the pigs face. Pigs were fit with Polar 610 IR heart rate monitors a few minutes before testing. Pigs were moved in groups of three with gentle force. Overall, there were no individual effects from any of the handling devices on heart rates of the pigs. However, pig heart rate was higher ( $P < 0.05$ ) during testing than before testing (172 ± 3.5 and 138 ± 3.6). Movement through the course with the flag took longer ( $P < 0.05$ ) compared with all other handling devices. Snaring is widely regarded as a stressful experience for the sow and regarded by some as inhumane. In Exp. 2, 12 gestating sows were fit with the Polar 610 IR heart rate monitors, allowed to rest, then snared for one minute, released and allowed to rest again. Interestingly, there were no statistical differences in the heart rate of the sows before, during, and after snaring. HR for before, during or after snaring, respectively, were 95.6, 93.2, 102.2 bpm ( $P > 0.10$ ). Though vocalizations were observed among snared sows, they were not accompanied by an elevated heart rate. These results support the notion that pig vocalization is a defensive response not associated with elevation in heart rate and that moving with any of the common handling devices used in a gentle manner produces equivalent heart rates.

**Key Words:** Swine Handling, Heart Rate, Swine Stress

**W15 Gender, age, and hormonal status affect recovery time from general anesthesia in pigs.** D. Wray-Cahen<sup>\*1</sup>, W. Pritchard<sup>1</sup>, A. Ashby<sup>1</sup>, E. Russek-Cohen<sup>1</sup>, J. Vossoughi<sup>2</sup>, and J. Karanian<sup>1</sup>, <sup>1</sup>Food and Drug Administration, Laurel, MD, <sup>2</sup>Biomed Research Foundation, Olney, MD.

Pain awareness during surgery is more prevalent in women than men and may be associated with the more rapid waking from general anesthesia observed in women. The gender, age, and hormonal status of an animal may affect how they respond to anesthesia and the speed at which they awaken from general anesthesia. To determine the effect of gender, hormonal status and age on anesthesia recovery time, we observed seven groups of pigs recovering from general anesthesia for interventional cardiovascular procedures: intact boars (M, n=21), barrows (MX, n=9), intact gilts (F, n=21), ovariectomized (OVX) gilts (FX, n=14), OVX gilts receiving estrogen (ERT, n=10), young gilts (YG, n=12), and young barrows (YB, n=7). Older pigs were all sexually mature and >90kg (X±SEM; 112±1kg). Young immature pigs were <32kg (25±4kg). After induction, a surgical level of general anesthesia (stage 3, plane 2) was maintained by

isoflurane inhalation. Pigs received isoflurane for 188±5 min. Minutes post-anesthesia for responses to stimuli and for motor control parameters to be elicited were recorded. Younger pigs (YG, YB) awoke from anesthesia much quicker than older pigs (P<0.001), getting on their sternum, sitting, and standing >4-times faster. Older gilts (F, FX, ERT) recovered more rapidly than M. Castration, but not OVX, reduced the overall response times. F responded to stimuli (nose pinching, leg pulling) >2.3-times sooner than M (P<0.001). M were slower than other older pigs to get on their sternum (171±17 v 96±7 min; P<0.001), sit (187±16 v 116±7 min; P<0.002), and stand (202±17 v 129±8 min; P<0.02), respectively. These data demonstrate that young pigs awaken from gas anesthesia much more quickly than older pigs and that females (and MX) awake more quickly than M. These results may also have implications for anesthesia rates necessary to maintain a surgical plane of anesthesia. Gender, age, and hormonal status should be taken into account when administering anesthesia to pigs.

**Key Words:** Gender, Anesthesia, Age

## Animal Health III

**W16 Gnathostomosis occurrence in wilds vertebrates in the south of Sinaloa State, Mexico.** E. Torres<sup>\*1</sup>, S. Sánchez<sup>1</sup>, C. De la Cruz<sup>2</sup>, J. J. Portillo<sup>3</sup>, and A. Lafón<sup>4</sup>, <sup>1</sup>EB-Universidad Autónoma de Sinaloa, Culiacan, Sinaloa, Mexico, <sup>2</sup>FCQ-Universidad Autónoma de Sinaloa, Culiacan, Sinaloa, Mexico, <sup>3</sup>FMVZ-Universidad Autónoma de Sinaloa, Culiacan, Sinaloa, Mexico, <sup>4</sup>FZ-Universidad Autónoma de Chihuahua, Chihuahua, Chihuahua, Mexico.

The present study was conducted on the hydrological basins of El Rosario and Escuinapa municipalities, located on the south of Sinaloa State, Mexico. The targets were to identify the hostesses that participate on the biological cycle of *Gnathostoma* spp and establish the probability of occurrence in the hostesses and habitats. A sample of 4469 vertebrates was obtained of a total of 27 species. Of these 15 were for fish, considered secondary hostesses; 1 of reptiles, 9 of birds, who participate as paratenic or accidental hostesses and finally 2 of mammals, considered to be definitive. Third stage larvae recovery and identification was made by the transillumination technique with samples of muscular tissue, been positive 6 species of fish, 1 of reptiles, and 4 of birds, which come from 4 types of habitat. Diagnosis of adult parasites was by stomach and esophagus direct observation finding only one positive mammal species which was *Didelphis virginiana* (Virginia opossum). Results were analyzed by logistical regression, the species with more probability of occurrence (P< 0.05) of *Gnathostoma* were to *Dormitator latifrons* (Pacific fat sleeper) 0.38, *Cichlasoma beani* (Green guapote) 0.23 y *Oreochromis* spp (*Tilapia*) 0.079. Seasonal and permanent ponds presented a bigger proportion of species of infected vertebrates (0.28 and 0.20). According with the obtained results it is concluded that *D. latifrons*, *C. beani* and *Oreochromis* spp were the most important species, so suggested no consumption of raw or not enough cooked meat seasonal them. Left hand, permanent ponds present a higher probability of favoring the presence of *Gnathostoma*, because of the number of secondary hostesses, from were the larvae come to concentrator and disperser hostesses, and the human being; closing the cycle on the definitive hostesses. Is it suggested to continue with the surveys over the hostesses and habitats, also avoiding the consumption of the registered species with high probability of occurrence, given the importance of this parasitosis in Sinaloa State and Mexico.

**Key Words:** Gnathostomosis, Zoonosis, Habitat

**W17 Evaluation of garlic (*allium sativum L.*) anthelmintic properties to control internal parasite populations in adult female Boer goats.** R. A. Franco and M. Worku<sup>\*</sup>, North Carolina A&T State University, Greensboro.

In keeping with organic standards, producers are using natural materials to treat parasites. Diminished health, growth rate and feed conversion have been observed in sheep. There is a need for controlled experiments to support the effec-

tiveness of these materials. Garlic (*allium sativum L.*) is actively antibacterial and may be effective. In order to evaluate a commercial, organically approved garlic product (Gempler's) as a dewormer and to establish dosing rates for goats, twenty female Boer goats weighing ~40 kg were assigned to four groups (0, ½ tsp, 1 tsp, and 2 tsp), of five animals each. A comparison of fecal egg counts (FEC) (for roundworms and coccidia eggs), packed cell volume (PCV), FAMACHA scores, and body weight (BW) in GI parasite infected goats vs untreated animals were evaluated. A general linear model (GLM) analysis was run on all variables using SAS. The results of FEC (roundworms and coccidian eggs), FAMACHA scores, PCV and BW are represented in Table 1. In the correlation analysis, FEC for roundworms had a positive correlation with FAMACHA scores (r = 0.323, P≤0.0015) and a negative correlation with PCV (r = - 0.338, P≤0.0009), but none with any other parameters. FEC for coccidia eggs negative correlation with PCV (r = - 0.207, P≤0.0475). There was no other correlation observed for FEC for this variable. High FEC for roundworm and coccidia eggs were observed when low PCV values were recorded. PCV had a negative correlation with FAMACHA scores indicating anemia (r = - 0.332, P≤0.0009). The organically approved garlic extract did not reduce FEC or alleviate anemia at the concentrations tested.

**Table 1. Data Averages for Treatment Groups and Variables Studied.**

Treatment group	FEC roundworms EGP <sup>ns</sup>	FEC coccidian EPG <sup>ns</sup>	FAMACHA score *	PCV % <sup>ns</sup>	BW Kg. *
Control	2195.6	293.4	2.4 <sup>ac</sup>	21.8	43.6 <sup>a</sup>
Group 2	3870.2	291.2	2.8 <sup>b</sup>	20.2	39.5 <sup>a</sup>
Group 3	1921.0	462.8	2.1 <sup>c</sup>	22.3	51.9 <sup>b</sup>
Group 4	1930.8	482.8	2.4 <sup>ab</sup>	20.5	46.7 <sup>ab</sup>

<sup>ns</sup> = non significant; \* = significant at 5% level of probability.

**Key Words:** Garlic, Parasites, Goats

**W18 Evaluation of FAMACHA<sup>®</sup>, PCV, BW and FEC as diagnostic approaches to evaluate the efficacy of Cydectin<sup>®</sup>(moxidectin) in controlling natural infections of *H. contortus* in adult female South African Boer, Spanish and Boer/Spanish cross goats.** O. Alexander, M. Worku<sup>\*</sup>, G. C. Bernard, and R. A. Franco, North Carolina A&T State University, Greensboro.

*Haemonchus contortus* is a gastrointestinal parasite that causes weight loss, anemia and possible death in livestock. The FAMACHA<sup>®</sup> card is a system in