

## Production, Management and the Environment: Production

**655 Adaption of a kinetic chromogen LAL test system to investigate the incidence of endotoxins on pig farms.** S. Schaumberger\*, C. Ratzinger, L. Krüger, and G. Schatzmayr, *BIOMIN Research Center, Tulln, Austria.*

Endotoxins cause a stimulation of the immune system and since they are ubiquitous in the environment their contribution to pig diseases has been repeatedly discussed. The objective of this study was to evaluate a test for measuring endotoxins in the farm environment and to determine the incidence of endotoxins on swine farms. Feed, water and air samples were taken from 16 pig farms and 32 sows were sampled (milk, feces and urine) between the first and third lactating week. All samples were tested with the kinetic chromogen Limulus-Amoebycat-Lysat test (LAL). Feces, air and feed were extracted with Tween20 for 1 h and dilution rows of all samples were prepared within 12 h after sampling. Predefined dilutions were used for testing. Tests were evaluated valid with a  $r^2$  of the calibration line  $> 0.97$  and the recoveries ranging between 50 – 200% of added LPS. Data were statistically analyzed using PASW 18.0 (formerly SPSS Statistics). The first step was to identify the lowest valid sample dilution to use, since using high dilutions can lead to a rise in endotoxin activity in the sample. Reproduction of endotoxin measurements with the LAL test over a period of time revealed a deviation of 15% compared to the first measurement. Nevertheless, endotoxin values of the different matrices showed high variation among farms. Problems concerning the sensitivity of the test system and sample preparation could be overcome. Interferences in samples were inhibited by diluting and heat inactivation before testing. These steps in addition with routine handling led to valid and reproducible results. This study demonstrated the prevalence of endotoxins in pig farms; however, we were unable to draw any conclusions about the correlation between occurrence of endotoxins in the farm environment and impairment of pig health. Therefore, additional research is needed.

**Key words:** endotoxin, swine, environment

**656 Effect of day of mixing gestating sows on measures of reproduction and animal well-being.** M. Hopgood\*, L. Greiner<sup>2</sup>, J. Connor<sup>2</sup>, J. Salak-Johnson<sup>1</sup>, and R. Knox<sup>1</sup>, <sup>1</sup>University of Illinois, Urbana, <sup>2</sup>Carthage Veterinary Service, Carthage, IL.

Available data provides limited evidence that mixing gestating sows during certain periods, including peri-implantation, disrupts pregnancy establishment and reduces litter size. We designed a study to test the effect of day of mixing on reproduction and measures of sow well-being. Mixing was conducted in replicates ( $n = 5$ ) on a commercial farm in Illinois. Mixed parity (2–6) sows ( $n = 1,436$ ) were assigned to treatment during June through August. At estrus sows were assigned to one of 4 treatments: 1) housed in crates from weaning until d 110 of gestation (Crate  $n = 20$ /replicate); 2) housed in crates after weaning and mixed in a pen at d 3 of gestation (D3 Mix,  $n = 58$ /pen/replicate); 3) housed in crates after weaning and mixed in a pen at d 14 of gestation (D14 Mix,  $n = 58$ /pen/replicate); and 4) housed in crates after weaning and mixed in a pen after d 35 gestation (D35 Mix,  $n = 58$ /pen/replicate). On d 3, 6, 9, 12 and bi-weekly after mixing until d 110, all sows were observed for lesion and body condition score. Sub-sample populations ( $n = 15$ /treatment) were identified from d 3 high, moderate, and low lesion score sows to collect serum for cortisol and progesterone. All sows were assessed on d 30 by ultrasound for pregnancy status. Binomial data were analyzed using GENMOD

and continuous data by the MIXED procedures of SAS for the main effects of replicate and treatment. Conception rate differed ( $P < 0.001$ ) by treatment with D3 (87%) and D14 (90%) reduced compared with D35 (94%) and Crate (95%). Preliminary data for the first 3 replicates indicates total born (12.2 pigs), born alive (11.6), mummies (0.1) and stillborns (0.6) were not affected by treatment ( $P > 0.10$ ). Future data will include additional measures for reproduction and animal well-being. Our preliminary analyses suggests that mixing sows at d 3 and d 14 is associated with lower conception but not litter size. The effect of treatment on the key reproductive measures of farrowing and litter size in addition to the critical measures of animal well-being will be needed for accurate interpretation of this experiment.

**Key words:** reproduction, sow, well-being

**657 A pig growth model for assessment of environmental footprint from swine operations: Effect of dietary energy and lysine supply.** A. B. Strathe\*<sup>1</sup>, A. Danfaer<sup>2</sup>, H. Jorgensen<sup>2</sup>, and E. Kebreab<sup>1</sup>, <sup>1</sup>Department of Animal Science, University of California, Davis, <sup>2</sup>Department of Animal Health and Bioscience, Faculty of Agricultural Sciences, Aarhus University, Blichers Allé, Tjele, Denmark.

In swine operations, greenhouse gas emissions are mostly from stored manure. Accurate prediction of manure composition is required to estimate environmental footprint from swine operations. Pig growth models are often used to optimize profitability of swine production facilities; however, their application may be more valuable through assessment of environmental footprint from swine production. The study aims to describe and evaluate nutrient partitioning and excretion in a pig growth model to be used in predicting manure volume and composition. From a biological perspective, nutrient excretion can be viewed as the “residual” and hence prediction of nutrient partitioning between protein (PD) and lipid deposition (LD) is central. The model represents the partitioning of digestible nutrients from intake through intermediary metabolism to body protein and body fat. The model contained 3 state variables: Amino acids, fatty acids and a central pool of metabolites that supplies substrate for lipid synthesis and oxidation. Body protein and fat represented the body constituent pools. It was assumed that fluxes of metabolites follow saturation kinetics depending on metabolite concentrations. The feed intake can either be defined by the user or ad libitum intake may be simulated by means of an algorithm for metabolic regulation. The model was developed using the open source software R. The data of Bikker et al. (1994, 1995 and 1996) [J. Anim. Sci. 72:1744–1753, 73:2355–2363 and 74:817–826] was used to evaluate model predictions. The data had 48 different feeding regimens with contrasting energy and lysine intakes at 2 different stages of growth. The overall observed and predicted mean were 109, 112, and 132 and 136 g/d for PD and LD, respectively, suggesting minor mean bias. The overall mean square prediction error was 2.2 g/d and 4.1 g/d for PD and LD, respectively.

**Key words:** simulation modeling, nutrition, sustainability

**658 Evaluating the biological and economic differences between light- and heavy-birth weight piglets.** D. A. Widmar\*, N. J. Olynk, A. P. Schinckel, B. T. Richert, and K. A. Foster, *Purdue University, West Lafayette, IN.*

Not all piglets are created equal. A host of genetic and environmental influences create biological variation in the growth and production of hogs. Variation begins at birth and follows the piglet throughout its life, ultimately creating variation in the economic performance of individual hogs. The objective of this research was to evaluate how light-birth weight (birth weights less than 1.0kg) piglet's biological growth and economic performance differs from heavy-birth weight (birth weights greater than 1.0kg) piglets. A bioeconomic model was constructed to simulate individual piglet growth and performance. Implications resulting from sow parity, litter size, competition while nursing, crowing while in feeding pens, and survivability were included. The stochastic model simulated each piglet's daily bodyweights, daily feed intake, carcasses characteristics, and market value to track its unique revenues and costs. By tracking individual piglet performance, it was possible to analyze the average performance of different groups of piglets, in this analysis piglets sorted into light- or heavy-birth weight groups. Under the assumptions of the model, the initial difference in bodyweights for the average light- and heavy-birth weight piglet, or the difference at birth, between the two groups was relatively small. Over their lifespan however, the differences between the groups becomes increasingly pronounced. Costs, revenues, and returns on an individual piglet basis were calculated. Heavy-birth weight piglets were more profitable, on average, than light-birth weight piglets. Light-birth weight piglets were found to have a greater probability of zero or negative returns. However, it was observed that the relationship between the two groups is not static. The difference between the group's expected profitability, and the probability of achieving an expected level of return, was impacted by the growth curves of the piglets in the two groups and changing values of pigs at time of market. This research provides producers with insight about the biological and economic performance of piglets with varying birth weights.

**Key words:** farm management, stochastic modeling, piglet birth weight

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**661 Doe reproductive rates among Boer F<sub>1</sub> and four purebred genotypes including Myotonic in the southeastern United States.** A. Nguluma\*<sup>1</sup>, R. Browning Jr.<sup>1</sup>, A. Pellerin<sup>1</sup>, J. Groves<sup>1</sup>, and M. Leite-Browning<sup>2</sup>, <sup>1</sup>Tennessee State University, Nashville, <sup>2</sup>Alabama A&M University, Huntsville.

This study evaluated primiparous does produced in a diallel of Boer (B), Kiko (K), and Spanish (S) meat goat breeds. An assessment was also made on Myotonic (M) purebred does. Straightbred and reciprocal BxK and BxS F<sub>1</sub> crossbred (BX) does (n = 192) born across 2 yr were evaluated. All does were exposed to M bucks. Rate of does kidding was higher ( $P < 0.01$ ) for BX does than for B does but not different from S or K does. Kidding rate was affected by maternal grandsire breed ( $P < 0.01$ ) and maternal granddam breed ( $P < 0.05$ ). Kidding rate of daughters of B dams was lower ( $39.7 \pm 21.0\%$ ) than for S ( $59.7 \pm 21.3\%$ ) and K dams ( $61.7 \pm 21.0\%$ ). Kidding rate of B-sired daughters was lower ( $34.0 \pm 21.0\%$ ) than from K ( $63.3 \pm 21.2\%$ ) or S sires ( $64.0 \pm 21.0\%$ ). Rate of does weaning kids did not differ among BX, B, K, and S. Weaning rate was affected by maternal grandsire breed ( $P <$

$0.05$ ) and maternal granddam breed ( $P < 0.001$ ). More daughter of K ( $55.0 \pm 17.4\%$ ) or S dams ( $50.6 \pm 17.4\%$ ) weaned a kid than from B dams ( $29.1 \pm 17.3\%$ ). Higher proportion of K-sired ( $55.9 \pm 17.6\%$ ) and S-sired daughters ( $52.0 \pm 17.4\%$ ) weaned a kid than from B sires ( $26.8 \pm 17.3\%$ ). Stayability through 1 yr did not differ among BX, B, K, and S genotypes. A higher proportion ( $P = 0.06$ ) of K-sired ( $78.1 \pm 6.7\%$ ) and S-sired daughters ( $85.1 \pm 6.2\%$ ) stayed in the herd than from B sires ( $63.7 \pm 6.2\%$ ). Heterosis level was important ( $P < 0.05$ ) for kidding rate, but not ( $P > 0.2$ ) for weaning or stayability rates. Among purebreds, kidding rate was lower ( $P < 0.02$ ) for B does ( $1.7 \pm 22.0\%$ ) than for K ( $65.0 \pm 19.2\%$ ), M ( $45.9 \pm 18.8\%$ ) and S does ( $67.7 \pm 19.2\%$ ); the later 3 did not differ. Weaning rate was lower ( $P < 0.01$ ) for B ( $2.7 \pm 17.7\%$ ) than K ( $62.9 \pm 13.6\%$ ) and S does ( $55.3 \pm 13.7\%$ ); M ( $30.5 \pm 13.1\%$ ) only differed from K ( $P < 0.05$ ). Stayability for B, K, M and S does was  $54.6 \pm 16\%$ ,  $93.6 \pm 6.9\%$ ,  $82.5 \pm 6.0\%$  and  $76.7 \pm 7.0\%$ , respectively. Only B and K differed ( $P < 0.05$ ). In summary, BX performed better than B but did not differ from S and K. Heterosis was only evident for fertility. Among purebreds, M had relatively better stayability, but lower reproductive rates.

**Key words:** meat goats, crossbreeding, reproduction

**662 Survival rates within a breeding population of Boer, Kiko, and Spanish does managed in the southeastern United States.** A. Pellerin\*<sup>1</sup>, R. Browning Jr.<sup>1</sup>, M. Leite-Browning<sup>2</sup>, and M. Byars, Jr.<sup>1</sup>, <sup>1</sup>Tennessee State University, Nashville, <sup>2</sup>Alabama A&M University, Huntsville.

Straightbred Boer (n = 132), Kiko (n = 92) and Spanish (n = 79) does were evaluated to determine if meat goat breed influences doe survival rates. The herd was semi-intensively managed on humid subtropical pasture in central Tennessee. Annual herd records across 6 production years (2003–04 to 2008–09) were used to assess survival rates and determine the reasons for doe exits. Does entered the herd in each year except Year 6. Regardless of entry year, records for all does remaining in the herd at the conclusion of Year 6 were considered censored (n = 106) and all does that exited the herd were considered failures (n = 197). All does that entered the herd had the opportunity to complete at least 2 yr of production. Does were bred to kid once each year. All culling from the breeding herd was involuntary. Does were culled if they failed to wean a kid for any 2 yr on study. Survival analysis to compare breeds within the herd was done by the product-limit method using the LIFETEST procedure of SAS (SAS Inst. Inc., Cary, NC). There were significant differences between the Boer and Kiko ( $P < 0.001$ ) and between the Boer and Spanish ( $P < 0.001$ ) for survival rate. No significant difference ( $P = 0.285$ ) was found between the Kiko and Spanish. Overall survival rates and survival rates up to 2 yr in the herd were lower for Boer does ( $10.54 \pm 0.03\%$ ,  $58.33 \pm 0.04\%$ ) than for Kiko ( $39.08 \pm 0.06\%$ ,  $85.87 \pm 0.04\%$ ) and Spanish ( $31.99 \pm 0.06\%$ ,  $83.54 \pm 0.04\%$ ) does. Individual doe exits were categorized into health, reproductive and accidental causes. Health-related failures constituted the largest proportion of whole-herd exits (78.68%) followed by reproductive failures (14.72%) and accidental losses (6.60%). These proportions were similar within each individual breed population. Breed of doe significantly influenced survival rates. Boer does demonstrated a lower level of fitness than the Kiko and Spanish does as evidenced by relatively higher exit rates under the management conditions of this study.

**Key words:** meat goats, breed, survival rate