Nonruminant Nutrition: Mineral and Sow Nutrition

W210 A lactation curve model in sows. A. V. Hansen*[1,2], A. B. Strathe[1], E. Kebreab[1], and P. K. Theil[2], [1]*Department of Animal Science, University of California, Davis,* [2]*Department of Animal Health and Bioscience, Faculty of Agricultural Sciences, Aarhus University, Blichers Allé 20, 8830 Tjele, Denmark.*

A quantitative description of the functional form of the sows lactation curve is crucial in understanding energy and nutrient partitioning and for estimation of nutrient requirements. The aim of the investigation was to modify a mathematical function and estimate its parameters from milk yield (MY) measurements. Three Danish studies on sows (Yorkshire x Danish Landrace) were used and MY was measured by D_2O dilution technique. The first study included 4 sows (n = 4) and MY was measured on d 4, 11 and 18 of lactation, in the second (n = 8) MY was measured on d 10, 17 and 24 and in the third (n = 48) MY was measured on d 9, 16 and 23, respectively. The litter size (LS) varied from 5 to 14 piglets while litter weight gain (LG) varied from 0.21 to 4.2 kg/d. A modified Gompertz function ($y(t) = (y_m/t_m) \times t \times \log(t_m \times e/t)$, $0 < t \leq t_m \times e$) was adopted and parameterized to include MY at peak lactation (y_m), the time to peak lactation (t_m) and e is the exponentiation to 1. The function is right skewed, and hence the acceleration in MY to peak lactation is faster than the deceleration in late lactation. The function was implemented in a Bayesian hierarchical model where the parameters describing the between sow variability were modeled as log-normally distributed. Its mean structure included covariates study, LS and LG, which were centered before entering the analysis. Non-informative priors were assigned to the parameters as the likelihood should dominate the posterior. The analysis was conducted in WinBUGS. Parameters y_m and t_m were affected by study, LS and LG ($P < 0.05$) as indicated by the 95% credible intervals. The mean MY at peak lactation was 12.7 (12.1; 13.2) kg/d at d 21 (19; 22) and the associated between sow variability in ym and tm was 15% and 24%, respectively. The following relationships were established between parameters and LS and LG ($y_m = \exp(2.54_{(SE:0.02)} + 0.043_{(SE:0.02)} \times (LS\text{-}11) + 0.23_{(SE:0.05)} \times (LG\text{-}2.7))$) and (($t_m = \exp(3.02_{(SE:0.04)} + 0.027_{(SE:0.03)} \times (LS\text{-}11) + 0.74_{(SE:0.09)} \times (LG\text{-}2.7))$)), which is applicable in predicting MY in sows with known LS and LG. The data analysis also revealed that although LS and LG affected y_m their effects on the shape of the lactation curve were minor.

Key words: milk production, Gompertz, sows

W211 Impact of ergot infested sorghum on the reproductive performance of sows. G. M. Abdelrahim*[1], R. C. Richardson[2], and A. Gueye[3], [1]*Alabama A&M University, Normal,* [2]*Texas State University, San Marcos,* [3]*Mt. Ida College, Newton, MA.*

The objective of this research was to evaluate effects of ergot infested sorghum (EIS) in sows' diets on animal and reproductive performance throughout 2 parities, including number of live born pigs (LBP), weight of live born pigs (WLBP), survival of pigs at d 28(S- 28 d), weight gain of pigs at d 28 (W- 28 d), weight gain at d 56 (W- 56 d), lactation feed intake (LFI), lactation weight change (LWC), and weaning-to-estrus interval (WEI). Total alkaloid concentration in the mature ergot sphacelia/sclerotia was 235 mg/kg (77% as dihydroergosine). In the experiment, 18 later-parity sows (BW = 155 ± 17 kg; n = 18) stratified by BW (n = 6 sows/diet) were fed 3 treatments consisting of a sorghum-based control diet mixed with 1) 0% EIS; 2) 5% EIS and 3) 10% EIS (which equaled 0, 11.75 and 23.50 mg/kg, respectively). There was no effect ($P > 0.05$) on LBP, S- 28 d, W- 56 d, and LWC when we fed up to 10% EIS to sows during the first and second parity; similar results were obtained when LBP, S- 28 d, W- 56 d, and LWC data of the 2 parities were combined. An increase in WLBP was observed ($P < 0.05$) when 5- 10% EIS was included in the second parity's diets, although LFI was significantly ($P < 0.05$) reduced when EIS was included in that parity's diets. Although W-28 d was not affected when 10% EIS was included in the first and second parities' diets and when W-28 d data of the 2 parties were combined ($P > 0.05$), piglets weight gain at 28 d was reduced ($P < 0.05$) when 5% EIS was included in the first parity's diet and when W-28 d data of the 2 parities were combined ($P < 0.05$) Although, treatment diets did not affect ($P > 0.05$) WEI of pigs in the second parity and when WEI of the 2 parties were combined ($P > 0.05$), and no response ($P > 0.05$) was recorded when 5% EIS was fed during the first parity, the inclusion of 10% EIS had significantly decreased the WEI ($P < 0.05$). Overall, variables that were affected by the inclusion of ergot sclerotia in the diets were WLBP, W- 28 d, LFI, and WEI.

Key words: ergot alkaloids, sows reproductive performance, sorghum

W212 Improved retention rates and reduced culling for lameness for sows fed a chelated trace mineral blend. J. Zhao*[1], L. Greiner[2], G. Allee[3], M. Vazquez-Anon[1], C. D. Knight[1], and R. J. Harrell[1], [1]*Novus International Inc, St Charles, MO,* [2]*Innovative Swine Solutions, Carthage, IL,* [3]*University of Missouri, Columbia, MO.*

Our objectives of this study were to improve sow retention rates by feeding a chelated trace mineral blend (Mintrex, Novus) from weaning and continuing through the reproductive phases. Two sister sow farms with a common grandparent farm were used. One farm was fed an inorganic control (ITM) and the other was fed a Mintrex blend (Zn, Mn, and Cu), which replaced 50% of the ITM, with target supplementation levels of Zn, 165 ppm, Cu, 16 ppm, and Mn, 38 ppm in the final diet. Replacement gilts were blocked by group on the basis of each monthly supply of weaned gilts. The group of sows was the experimental unit for statistical analyses. Results indicated that gilts fed Mintrex (n = 10,725) had lower removal rates than gilts fed ITM (n = 10,729) from first service to farrowing (8.0% vs. 8.8%, $P = 0.04$). Subsequent retention rates were analyzed for sows that were on treatment from weaning to parity 4 (n = 3994 and 4418 for Mintrex vs. ITM, respectively). Sows fed Mintrex had higher ($P < 0.01$) retention rates than sows fed ITM at both Parity 3 and Parity 4 (72.1% for sows fed Mintrex and 63.5% for those fed ITM, respectively). The involuntary removal rate and relative removal rate due to locomotion were reduced with Mintrex supplementation. In gilts, relative removal rates due to locomotion were 9.0 vs 13.8% ($P < 01$) for Mintrex and ITM, respectively. The involuntary removal rates were reduced ($P < 0.01$) for gilts fed Mintrex (17.3%) compared with gilts fed ITM (27.1%). Similar results were observed in sows in that removal rates due to locomotion were reduced by 55% with Mintrex supplementation (10.4% vs. 16.1%; $P < 0.01$) compared with sows fed ITM. The involuntary removal rates were reduced by 45% with Mintrex supplementation (19.4 vs 28.1%; $P < 0.01$) compared with sows fed ITM. Overall mortality was reduced with 8.6% mortality for sows fed Mintrex and 10.4% for those fed the control. In summary, Mintrex is beneficial for maintaining sow skeletal health and improving welfare assessed by higher survival rates to parity 4 and lower removal rates due to locomotion.

Key words: sow, lameness, chelated trace mineral

W213 A blend of chelated trace minerals improved sow cumulative reproduction and farrowing rate. J. Zhao*[1], L. Greiner[2], G. Allee[3], M. Vazquez-Anon[1], C. D. Knight[1], and R. J. Harrell[1], [1]*Novus International Inc., St Charles, MO,* [2]*Innovative Swine Solutions, Carthage, IL,* [3]*University of Missouri, Columbia.*

In many commercial units sow output falls considerably short of the potential to produce weaned piglets per her lifetime, with over 50% of sows culled before reaching their third or fourth parity. Our objectives were to determine if feeding a chelated trace mineral blend (Mintrex®, Novus International Inc.) from weaning and throughout the reproductive phases in commercial farms would improve farrowing rates and cumulative reproductive performance. Two sister PRRS-stable sow farms (6,400 sows each) using PIC C22 and C29 genetics with a common grandparent farm were fed either an inorganic control (ITM) or a Mintrex blend (Zn, Mn, and Cu), which replaced 50% of the ITM, with target supplementation levels of Zn, 165 ppm, Cu, 16 ppm, and Mn, 38 ppm in the final diet. Replacement gilts were blocked by group on the basis of each monthly supply of weaned gilts. The experiment was conducted for 3 years from April 2007 to April 2010. To calculate cumulative reproduction performance up to parity 4, only sows within groups that were old enough to produce at least 4 parities were included in the data analyses. This included a total of 8,412 sows for the analyses. Farrowing rate was improved 2.3 percentage units with Mintrex supplementation (86.8% vs. 84.5% for Mintrex and ITM, respectively, $P < 0.001$). The benefit was observed across parities except in parity 2 with farrowing rates of 86.4% vs. 83.6%, 84.9% vs. 83.9%, 87.7% vs. 85.8%, and 88.9% vs. 85.4% from parity one to parity 4 for Mintrex vs. ITM, respectively. Sows fed Mintrex had more total born (44.1 vs. 40.8, $P = 0.02$) and born alive (41.6 vs. 38.9, $P = 0.04$), and tended to have more weaned pigs (36.4 vs. 34.6, $P = 0.07$) compared with those fed ITM. Presence of mummies was not affected by treatment (0.69 vs. 0.67, $P = 0.47$). Sows fed Mintrex had more stillborns compared with sows fed ITM (1.8 vs. 1.2, $P < 0.01$). In summary, sows fed Mintrex had higher farrowing rates and better cumulative production performance up to parity 4.

Key words: sow, chelated trace mineral, reproduction

W214 Improved progeny performance from sows fed a chelated trace mineral blend. J. Zhao*, M. Vazquez-Anon, C. D. Knight, and R. J. Harrell, *Novus International Inc, St Charles, MO.*

Our previous study indicated sows fed Mintrex produced heavier piglets at birth compared with sows fed inorganic mineral. We hypothesized that piglets with heavier birth weights should perform better from weaning to market weight. Trial design consisted of a 2*3 factorial arrangement with 2 progeny sources from sows fed either inorganic trace minerals (ITM) or Mintrex and 3 dietary mineral programs. The 3 dietary mineral programs included an ITM or Mintrex supplementation at 50% of NRC levels (Zn 50 mg/kg, Mn 2 mg/kg, and Cu 3 mg/kg), and ITM at 2X NRC levels. A total of 2400 weanling pigs (PIC, 20 d of age, 6.07 ± 0.07 kg) were randomly allotted to 6 treatments with 16 replications per treatment and 25 pigs per pen. Data was analyzed by PROC GLM for main effect of progeny, dietary minerals, and 2-way interaction. No interaction of progeny source and dietary mineral treatment was observed on performance or carcass traits ($P > 0.10$). Overall, no differences were observed among pigs fed the 3 different dietary mineral programs ($P > 0.10$). The main finding in this trial was the effect of progeny source. No differences were observed in starting pig weights (20 d of age, $P = 0.27$) between progeny source. However, compared with progeny from sows fed ITM, progeny from Mintrex sows were heavier by d 10 post-weaning (8.09 vs. 7.25 kg, $P < 0.01$) and remained heavier until the end of the study on d 161 (118.5 vs. 116.5 kg, $P = 0.02$). During the nursery period (d 0–42), Mintrex progeny ate more ($P < 0.01$), gained more ($P < 0.01$) and were 2.5 kg heavier at the end of nursery ($P < 0.01$) compared with pigs from sows fed ITM. Overall (d 0–161), progeny from sows fed Mintrex ate more (1.75 vs. 1.72 kg/day, $P < 0.01$), gained more (0.701 vs. 0.686 kg/day, $P < 0.01$) and tended to have greater loin depth (47.3 vs. 45.6 cm^2, $P = 0.09$) compared with progeny from sows fed ITM. No treatment differences were observed on G:F, carcass yield, and meat quality traits ($P > 0.10$). In summary, progeny from sows fed Mintrex performed better and had greater loin depth than piglets from sows fed ITM and demonstrates that sow mineral source affects their progeny performance.

Key words: pig, Mintrex, trace mineral