M228 The effects of dietary inclusion of organic selenium (Sel-Plex) on ewe milk selenium level and lamb growth. M. Foley[1], T. M. Boland[1], S. Andrieu*[2], M. Guinan[1], and T. F. Crosby[1], [1]*University College Dublin, Belfield, Dublin, Ireland*, [2]*Alltech Ireland, Dunboyne, Co. Meath, Ireland*.

Fifty ewes were used to determine the effects of the inclusion of organic selenium (Sel-Plex; Alltech, Inc.) in the concentrate supplement during the final seven weeks of pregnancy on ewe performance, milk selenium level and lamb growth rate to weaning. The ewes were estrus synchronized and randomly allocated to one of the two treatments at 98 d post-mating. All ewes were offered a grass silage diet ad libitum which was supplemented with 500 g (98 - 133 d) or 700 g (134 d - 24 h post-partum) of concentrate. The concentrate supplement was fortified with either 0.875 mg/kg sodium selenite (T1) or 0.875 mg/kg Sel-Plex (T2). Ten ewes from each treatment were kept indoors for 10 d post-partum and offered the same experimental concentrates as given prior to lambing. These ewes were hand milked at 10 d and the milk selenium content determined. Ewe liveweight was recorded at the beginning of the trial and 24 h post-partum and lamb growth rate was measured up to weaning at 105 d. Ewe liveweight loss from 98 d of gestation to 24 h post-partum was higher in T1 (-5.5 vs. -3.4 kg; SEM 0.8; $P = 0.07$). Sel-Plex supplementation increased the level of selenium in the milk at 10 d (60 vs 98 µg/l; SEM 4.9; $P < 0.001$). There was no treatment effect on mean lamb birth weight ($P > 0.05$), with birth weights of 4.9 kg (T1) and 5.0 kg (T2) recorded. Lambs from the Sel-Plex treatment had a higher growth rate in the first 35 d post-partum (292 vs. 326 g/d; SEM 9.9; $P < 0.05$). Overall lamb growth rate from birth to weaning tended to be higher in T2 (231 vs. 249 g/d, SEM 7.0; $P = 0.08$) and this was reflected in lambs on the Sel-Plex treatment being 2 kg heavier at weaning (29.1 vs 31.1 kg; SEM 0.77; $P = 0.07$). We conclude that Sel-Plex supplementation of the pregnant-lactating ewe diet will result in higher milk selenium levels, improved ewe performance and a positive effect on lamb growth and weaning weight relative to inorganic selenium.

Acknowledgements: The authors wish to thank Alltech and Enterprise Ireland for funding this project

Key Words: Sel-Plex, Sheep, Milk Selenium

M229 Milk yield and milk composition of Santa Ines ewes. I. Susin*, A. V. Pires, C. Q. Mendes, I. U. Packer, and R. C. Araujo, *ESALQ/University of São Paulo, Piracicaba, SP, Brazil*.

Milk yield estimates for the Brazilian, non seasonal, hair sheep called Santa Ines are scarce. One hundred and thirty lactating Santa Ines ewes (55 kg BW) were used to estimate milk production and composition. Data were collected using the same protocol in three lambing seasons (years). All ewes were confined and had free access to a TMR to meet or exceed nutrient requirements for lactation. Milk yield was determined once a week (test-day), from second to eighth week of lactation. Ewes were milked twice in a 3 h interval using i.v. oxytocin for stimulation. Milk produced at second milking was weighed, recorded and sampled for composition determination by infrared analysis. A total of 910 test-day records were divided in five groups: G1- ewes rearing twin lambs (ERTL) in 2002; G2- ewes rearing single lamb (ERSL) in 2002; G3- ERSL in 2003; G4- ERTL in 2004 and G5- ERSL in 2004. Data of repeated measurement were analyzed with Proc Mixed of SAS, by a model including fixed effects of the contemporary groups above (year and type of rearing), parity, test-day, group x test-day, and random effect of ewe within group. Covariance structure used was the AR (1) type. There was a significant interaction between group and test-day for milk production, milk fat, protein and total solids. Milk production increased linearly from first to fifth lactation (1.26, 1.23, 1.35, 1.41 and 1.5 kg/d, respectively). Differences in milk production were observed for ERTL compared to ERSL only in early lactation. Milk yield of ERTL was 28% and 23% higher ($P < 0.05$) at second and third week of lactation, respectively in 2004 and 2002. Milk yield was adjusted as a quadratic equation in relation to days in milking, which indicated maximum production (peak) at 23, 26, 25, 16 and 34 d of lactation for G1, G2, G3, G4 and G5, respectively. Daily milk production using all data was 1.3 kg, and the average composition was 8.0% fat, 4.4% protein, 5.1% lactose and 18.6% total solids. These results indicate the importance of research efforts to increase milk production in this breed adapted to tropical conditions.

Key Words: Hair Sheep, Lactation, Performance

Swine Species: Swine Nutrition and Management

M230 The use of a modified farrowing pen: Effects on lactation performance of heat-stressed sows. C. Farmer*[1], T. Widowski[2], and D. Massé[1], [1]*Agriculture and Agri-Food Canada, Lennoxville, QC, Canada*, [2]*University of Guelph, Guelph, ON, Canada*.

The impact of using a modified farrowing pen (MOD) allowing evaporative cooling on lactation performance of heat-stressed sows was evaluated. Primiparous Yorkshire x Landrace sows were housed at 21 or 29°C from farrowing until the end of lactation (day 22). Animals from each group were assigned to a standard farrowing crate (STD; 21°C = 17, 29°C = 16) or a MOD pen (21°C = 19, 29°C = 19). The MOD pen consisted of a STD crate with a 1.5 x 1.6 m comfort zone in the back, equipped with rubber floor mats, a feeder and a nipple waterer. Litter size was standardized to 10 or 11. No creep feed was provided and piglets were weighed weekly. Sows were weighed on days 2 and 22. Feed intake of sows was monitored daily, a milk sample was obtained on day 21 (to measure DM) and jugular blood samples were collected on days 2 and 21 to measure prolactin, IGF-I and urea. Heat-stressed sows consumed less feed (3.4 vs 4.7 ± 0.1 kg/d, $P < 0.001$) than control sows and, at 29°C, sows in MOD pens consumed more feed (3.9 vs 3.0 ± 0.2 kg/d, $P < 0.01$) than sows in STD pens. Lactation weight loss was greater (-26.4 vs -19.1 ± 1.9 kg, $P < 0.05$) for sows in STD than MOD pens at 29°C. The reduction in prolactin concentrations from days 2 to 22 of lactation tended to be greater ($P = 0.08$) at 29°C for sows in STD pens. Concentrations of urea and IGF-I increased as lactation advanced ($P < 0.01$) and IGF-I was lower at 29°C than at 21°C on both days ($P < 0.01$) whereas urea was greater at 29°C on day 2 only ($P < 0.01$). Milk DM was less at 29 than at 21°C ($P < 0.01$). Average piglet weight gain was reduced at 29°C compared to 21°C during the second week of lactation ($P < 0.05$) and this reduction was less in MOD than STD pens during the third week of lactation ($P < 0.01$). From days 2 to 21 of lactation, heat stress reduced average piglet weight gain by 6.0% in MOD pens compared to 9.7% in STD pens.

Acknowledgements: Sincere thanks to Ontario Pork and Équipements Laliberté for financial assistance

Key Words: Farrowing Pen, Heat Stress, Lactation

M231 Effect of low energy diets fed to high lean pigs slaughtered at 115 kg of body weight. I. Moreira*, T. Voorsluys, D. Paiano, I. M. Sartori, M. A. A. Silva, and G. Jacob, *Universidade Estadual de Maringá, Maringá, Paraná, Brazil*.

An experiment was carried out to study the effect of low energy diets on performance and carcass traits of pigs slaughtered at 115 kg of BW. Thirty-six high lean pigs (1/2 female and 1/2 male) with 69.18 ± 6.44 kg initial BW were used. Treatments consisted of three diets (3,200, 2,900 and 2,720 kcal of ME/kg). The reduction of diet energy level was obtained by adding rice hulls (bran). Pigs, with free access to water and diets during experimental period, were allotted in treatments with four replicates of three pigs per replicate, in a completely randomized block design. Performance variables (feed intake, weight gain and feed: gain ratio), carcass traits (carcass yield, ham yield, loin muscle area and meat: fat ratio) and plasma urea nitrogen (PUN) were analyzed. When pigs reached 115.41 ± 6.20 kg BW, five pigs per treatment were slaughtered for carcass traits. Data were analyzed as a polynomial regression and performance data were estimated taking a pen with three pigs as experimental unit. In the

case of PUN and carcass traits each pig was considered an experimental unit. No effect of energy level reduction on performance, carcass traits and PUN was detected, although a numeric better (8.5%) feed: gain ratio was obtained at lower ME level. Results suggest that energy levels of diets, between 3,200 and 2,720 kcal of ME/kg, fail to influence performance and carcass traits of high lean pigs slaughtered at 115 kg BW.

Acknowledgements: CNPQ, UEM

Key Words: Energy, Fiber, Feed Restriction

M232 Pig manure production (qualitative and quantitative) of finishing pigs fed on diets containing different levels of energy and fiber. I. Moreira*, R. M. Martins, D. Paiano, A. C. Furlan, E. N. Martins, and L. S. Perdigão, *Universidade Estadual de Maringá*, *Maringá, Paraná, Brazil.*

A digestibility trial was carried out to evaluate the effects of energy restriction by using dietary fibers on manure quantity and quality and to assess the ensuing environmental impact. Thirteen barrows, initial average weight 84.8±4.5 kg, were used. Treatments consisted of three diets with different metabolizable energy (ME) levels (3,200, 2,960 and 2,720 Kcal of ME/kg). A corn-soybean meal diet, supplemented with dicalcium phosphate, limestone, vitamin-mineral premix, salt, lysine and rice hull as fiber source, was used. The three diets contained 12.73% CP, 0.68% lysine, 0.69% calcium, 0.46% phosphorous. Crude fiber levels were 2.51, 5.60 and 8.64%, related to decrease in ME levels. Diets and water were provided three times a day during 13 days. Total feces and urine were collected during the last five days. Decrease in the metabolizable energy by an increase of crude fiber level on finishing pig diets resulted in an increase ($p \leq 0.05$) of total feces production (dry matter and organic matter) without increasing the total excretion of nitrogen and phosphorus. There has also been a reduction of the digestibility of dry matter, crude protein and metabolization of crude protein, which decreased weight gain and impaired feed conversion. Results suggest that an increase in dietary fiber to reduce energy level leads towards an increase in feces production without increasing nitrogen and phosphorous production. This means more labor and cost on manure handling.

Acknowledgements: CNPq, UEM

Key Words: Environment, Feed Restriction, Pollution

M233 Avilamycin in the diet affects intestinal mucosal architecture and mucosa-associated bacteria in weaned pigs. B. Kleessen[3,2], R. Brunner[1], J. Kluess[1], W. Souffrant[1], U. Hennig[1], and C. Metges*[1], [1]*Research Institute for the Biology of Farm Animals*, *Dummerstorf, Germany*, [2]*German Institute of Human Nutrition (DIFE) Potsdam*, *Nuthetal, Germany*, [3]*Institute of Bacteriology and Mycology, University of Leipzig*, *Leipzig, Germany.*

Feed antibiotics have been included in the weaning diet of piglets to reduce postweaning stress reflected by reduced feed intake and weight gain, impaired digestive and absorptive function. We evaluated the effects of either a standard starter diet (StD; wheat, barley, whey) or StD + avilamycin (40 mg/kg) on mucosal morphometry of the intestine, and mucosa-associated bacteria of a total of 32 piglets (n = 8/group) at 1 and 15 d post-weaning. Addition of avilamycin to the diet resulted in higher villi and deeper crypts in the jejunum of piglets at 15 d postweaning compared with controls ($P < 0.05$). Avilamycin also increased thickness of tunica muscularis and numbers of goblet cells in the crypts of the duodenum of piglets ($P < 0.05$). In the ileum, caecum and colon, however, mucosal morphology was only affected by postweaning time ($P < 0.01$). Using fluorescent in situ hybridization with 16S/23S rRNA-targeted probes avilamycin resulted in a pronounced reduction of lactobacilli/enterococci counts in stomach, jejunum and colon ($P < 0.05$), whereas the gamma subdivision of Proteobacteria numbers were not changed. In contrast, lactobacilli/enterococci counts in duodenum, ileum and caecum were not affected by treatment. Digital image analysis by confocal laser scanning microscopy allowed the detection of mucosal invaded bacteria in the caecum and of spiral-shaped organisms in the stomach of avilamycin treated piglets at the age of 15 d postweaning. In conclusion, avilamycin added to a starter diet appeared to be beneficial for gut morphological characteristics, but may be detrimental to piglets health, because it is associated with the disruption of the mucosa-associated protective flora (i. e. lactobacilli), possibly facilitating mucosal bacterial penetration.

Acknowledgements: Funded by the EC grant HEALTHYPIGUT (QLK5-CT2000-00522)

Key Words: Intestinal Microbiota, Feed Antibiotic, Pig Health

M234 A high-resolution radiation hybrid map for swine. W.-S Liu*[1], K. Eyer[1], H. Yasue[2], B. Roelofs[1], H. Hiraiwa[2], T Shimogiri[3], E. Landrito[1], J. Ekstrand[1], M. Treat[1], and C. W. Beattie[1], [1]*University of Nevada*, *Reno*, [2]*National Institute of Agrobiological Sciences*, *Ikenodai, Tsukuba, Ibaraki, Japan*, [3]*Kagoshima University*, *Korimoto, Kagoshima, Japan.*

The swine physical map lacks the resolution required for fine mapping the 791 production QTLs (PigQTLdb; http://www.animalgenome.org/QTLdb/) currently reported and for providing a high-resolution scaffold for sequencing the swine genome. The radiation hybrid (RH) panels currently available for swine [the 3000-rad (T43RH), 5000-rad (SSRH), and 7000-rad (IMpRH)] provide sufficient resolution to order BAC contigs, but chromosome gaps and undefined synteny borders remain. We are characterizing a new, high-resolution, 12,000-rad panel (IMNpRH2) to fill gaps and identify all remaining synteny breaks and chromosomal rearrangements with the human genome (HGS). To date, we have typed and ordered ~4800 markers on the $IMNpRH2_{12,000\text{-}rad}$ panel, including ~1500 MS and 3300 genes/ESTs using the CarthaGene software. Retention frequencies ranged from 7.8% to 51.1%, avg. 33.1%. An initial $RH_{12,000\text{-}rad}$ map for pig chromosome 12 (SSC12), syntenic with HSA17, was constructed with 327 markers covering ~4866 $cR_{12,000}$. Sixteen linkage groups were ordered at LOD 6, based on framework markers previously mapped on the $IMpRH_{7000\text{-}rad}$ SSC12 and porcine genetic maps. The resolution of the current SSC12 $RH_{12,000\text{-}rad}$ map is approximately one marker ~ 250 kb, significantly improving the physical map of the pig. We expect to finalize a high-resolution, integrated $RH_{12,000\text{-}rad}$ map for swine with a total of ~12,000 markers including ~1500 MS, ~10,000 genes/ESTs and sufficient BESs to identify all breaks and close all gaps at an average resolution of ~15kb/cR by early 2006, to provide a high-resolution scaffold on which to help assemble the swine genome sequence.

Acknowledgements: This work was supported by USDA, CSREES (No. 2004-35205-14244).

Key Words: Swine, Genome, Radiation Hybrid Map

M235 Effects of operator and interpreter on real-time ultrasonic measures of backfat thickness and longissimus muscle area in pigs. L. L. Lo*, C. Y. Fang, H. C. Chung, Y. Y. Lin, and C. Y. Lien, *Chinese Culture University*, *Taipei, Taiwan*.

Several factors affect the accuracy of predicting the carcass composition using real-time ultrasound in pigs. Objectives of this study were to detect the effects of operator and interpreter for ultrasonic determination of backfat thickness (BF) and longissimus muscle area (LMA). A total of 102 Landrace, Yorkshire, and Duroc boars and gilts at six different growing stages (55, 65, 75, 85, 95, 105 kg of body weight), were scanned at the tenth and last rib by one experienced technician and three trained operators using an Aloka SSD 900 B mode ultrasound scanner for BF and LMA. All operators and the technician measured their own B-mode images after scanning. The images were then recorded and later read by an independent and trained interpreter using an image analysis system-ENCOMate®. Repeatabilities calculated as the intraclass correlation among animals for scanned tenth rib backfat (BFTN) was higher than those corresponding to the last rib (0.68 vs. 0.44). Ultrasound at the last rib longissimus muscle area (LMALR) measurement was more repeatable than those of the tenth rib (0.65 vs. 0.77). The coefficients of correlation between three operators and the technician ranged from 0.42 to 0.84, indicating the importance of operator effects, with ultrasonic measures of BF and LMA at the tenth rib had

higher values than those of at the last rib. Correlations between the measures of the BFTN and corresponding BF and LMA were similar between the technician and three operators. Coefficients of correlations were more varied in the last rib, with lower correlations between BFLR and LMALR. Correlations of LMA and BF at the tenth rib between the ultrasound technician and image interpreter were higher than those at the last rib (0.648, 0.560 vs. 0.518, 0.424). Results of this study indicated the importance of probing site, ultrasound and image interpretation in determining lean production associated with use of the Aloka SSD 900 B mode scanner. Method of evaluation and technical training standards, therefore, need to be established for operators of such equipment.

Key Words: Ultrasound, Repeatabilities, Body Composition

M236 Piglet performance and meat quality at slaughter in response to increased maternal feed allowance during mid gestation. A. Cerisuelo*[1], M. Baucells[1], J. Bonet[2], D. Carrión[3], S. Tibble[4], J. Gasa[1], and R. Sala[1], [1]*Universitat Aut&ogravee;noma de Barcelona*, *Spain*, [2]*Vall Companys Group*, *Spain*, [3]*PIC España, S.A.*, *Spain*, [4]*SCA Ibérica*, *Spain*.

The objective of this study was to verify the effect of increased maternal intake during mid-gestation on performance and carcass and meat quality traits at slaughter. Ninety-six sows were divided into two treatments and feed different amounts of feed from 45 to 80 days of gestation. Control sows (C=46) received 3.0 kg/day (2.9Mcal EM/kg and 6g lysine/kg) and experimental sows (E=50) received additionally +50% and +75% extra feed than control group for primiparous and multiparous sows, respectively. The offspring (castrated barrows) was reared conventionally during nursery (n=500) and growing-finishing (n=260) phases. They were divided in 5 weight groups and only group 3 (middle weight) and 4 (low weight) were used for carcass (carcass and main cuts yield, lean meat content and mid-line fat thickness at gluteus medium) and meat (pH24, Minolta colour and drip loss) quality measurements in *longissimus dorsi* and *semimembranosus* muscle. During nursery phase (from 7.3 kg to 16.5 kg), no differences were obtained (p>0.1) in average daily gain and average daily feed intake between treatments, but gain:feed ratio was higher in the E progeny (0.74 *vs* 0.72, p<0.05), specially in the smallest group of weight (Group 5). However, in the growing-finishing phase (up to 112 kg) no differences were observed between treatments. Higher feed allowance during mid-gestation did not affect carcass and meat quality traits at slaughter. Thus, this feeding practice during pregnancy did not show any benefitial effect on post-natal growth of the offspring. However, it seems to increase the growing efficiency of the lighter groups of pigs at nursery. Studies involving muscle fiber characteristics will be conducted to know if a higher feed intake from 45 to 80 days of gestation may induce differences in muscle fiber structure.

Key Words: Piglet Performance, Meat Quality, Maternal Nutrition

M237 Effect of additional feed allowance during mid gestation on body reserves changes and feed intake during lactation in lean sow genotype. A. Cerisuelo*[1], R. Sala[1], D. Carrión[2], J. Coma[3], S. Tibble[4], J. Gasa[1], and M. Baucells[1], [1]*Universitat Autònoma de Barcelona*, *Spain*, [2]*PIC España, S.A.*, *Spain*, [3]*Vall Companys Group*, *Spain*, [4]*SCA Ibérica*, *Spain*.

Restricted intakes during gestation may compromise maternal body reserve recovery in genetically lean sows; however, high backfat levels at farrowing have been related with a lower feed intake during lactation, affecting reproductive and lifetime performance. The present experiment was conducted to study the effects of supplemental feeding strategy during mid-gestation on body reserves changes and voluntary feed intake during lactation. Ninety-six LDxLW sows were allocated in two treatments at day 45 of gestation. Control sows (C=46) received an average of 3.0 kg/day (2.9 Mcal EM/kg and 6g lysine/kg) during all gestation period. Experimental sows (E=50) were provided from day 45 to 80 of gestation +50% and +75% higher amount of feed than control for primiparous (n=20) and multiparous (n=76) sows, respectively. Body weight (BW) and ultrasonically estimated backfat (BF) and loin depth (L2) were recorded at day 40 of gestation, at farrowing, at weaning (21 days) and at 40 days of the subsequent gestation. Average feed intake during lactation was registered. E sows gained more BW (34.5 kg *vs* 18.0 kg), BF (5.0 mm *vs* 3.0 mm) and L2 (5.1 mm *vs* 2.3 mm) than C sows during gestation (p<0.05). During lactation, E sows mobilized more BW (p<0.05) but BF and L2 losses were not different between treatments (p>0.1). Voluntary feed intake during lactation was significantly lower in the experimental group (4.1 kg/day *vs* 4.4 kg/day, p<0.05). In this case, gains of 2 mm of BF during gestation lead to a 300 g/day lower feed intake during lactation. In conclusion, leaner genotypes showed an interaction between mid gestation and lactation feed intake. However, this effect was not detrimental to body reserves as indicated the higher amount of BF and L2 found in the experimental group at weaning. Therefore, additional feed in gestation could avoid rebreeding and early culling problems in sows.

Key Words: Body Reserves, Feed Intake, Pregnant Sow

M238 Analysis of the association between farrowing and subsequent breeding performance with lactation feed intake. S. S. Anil*[1], L. Anil[1], J. Deen[1], S. K. Baidoo[2], and R. D. Walker[2], [1]*University of Minnesota*, *Saint Paul*, [2]*University of Minnesota*, *Waseca*.

A study was conducted at SROC, University of Minnesota, with 507 sows of parity 1-8 to analyze the association of lactation feed intake (LFI) with farrowing (litter birth and weaning weights, mummies and stillborn) and subsequent breeding (wean to service interval-WSI and conception) performances. Data on LFI, BW, backfat and farrowing and breeding performance were extracted from the sow records and PigCHAMP database. Logistic regression models were fitted to analyze the association of average LFI with farrowing performance and subsequent breeding performance. In the model with farrowing performance, change in body condition (weight and backfat changes) during lactation was also included. The LFI was categorized as lower or higher than the average (6.780 ± 0.07kg), mummies and stillborn were categorized as either present or absent, WSI was categorized as ≤5 or ≥6 days, conception as conceived or not conceived after breeding, parity was grouped into 3 as 1 and 2, 3-5 and ≥6 and the changes in BW and backfat were categorized as lower or higher than the average. Litter weights at birth and at weaning and lactation length were included as continuous variables. The likelihood for higher (≥mean) average LFI increased (P ≤ 0.05) with an increase in litter weights at birth and weaning (Odds Ratio (OR): 1.076, Confidence interval (CI): 1.011-1.145 and OR: 1.049, CI: 1.025-1.075, respectively). The likelihood for higher average LFI was (P ≤ 0.05) lower for sows of parities 1 and 2 compared to sows of parities≥ 6 (OR: 0.207, CI: 0.120-0.357). A higher average LFI was associated with an increase in BW at weaning compared to the BW at d 108 of gestation (OR for change in BW: 5.112, CI: 3.063-8.530). Lactation length, presence or absence of stillborn and mummies and backfat change had no association with LFI. Average LFI was found to have no association with WSI or subsequent conception. The results indicated that lactation feed intake was associated with parity, litter weights at birth and weaning and BW change whereas it showed no association with subsequent breeding performance.

Key Words: Lactation Feed Intake, Performance

M239 Effect of different levels of soybean hulls in growing and finishing pigs diets. I. Moreira*[1], A. R. B. Quadros[2,1], A. R. P. Parra[3,1], C. R. Ribeiro[1], N. Silvestrin[1], and C. Scherer[1], [1]*Universidade Estadual de Maringá*, *Maringá, Paraná, Brazil*, [2]*Universidade Federal de Santa Maria*, *Santa Maria, Rio Grande do Sul, Brazil*, [3]*Universidad del Tolima*, *Ibagué, Tolima, Colombia*.

A study was carried out over an 80-d period (34-d for growing and 46-d for finishing phases) to evaluate the effect of inclusion of different levels of soybean hulls (SH) in diets for growing/finishing pigs. SH contained (as-fed basis): 91.87% DM, 17.64% CP, 2,670 kcal DE/kg, 0.29 P, 0.52% Ca, 51.44% NDF. Forty crossbred pigs, average body weight 27.84 kg, were blocked by weight and randomly assigned to five experimental diets, with four replicates, with two pigs per pen (experimental unit). Treatments consisted of inclusion (0.0; 4.0; 8.0; 12.0 and 16.0%) of soybean hulls (ground at 2.5 mm) in an

isoenergetic (3,385 kcal DE/kg) diet (16.4 and 15.0% CP) for growing and finishing phases, respectively. When pigs reached an average body weight of 55.0 kg, diets were changed to finishing phase. Pigs were given free access to feed and water. Pigs were weighed and blood samples collected at start, 34-d and end of experimental period. Plasma urea nitrogen (PUN) and fat thickness (FT) was determined at the end of each experimental period. Results for growing phase (34-d) were: ADFI - 2.04; 1.95; 1.94; 1.94 and 2.05 kg; ADG - 0.80; 0.81; 0.76; 0.79 and 0.84 kg; G:F - 2.58; 2.42; 2.55; 2.45 and 2.44; PUN - 8.63; 7.64; 8.82; 8.91 and 8.16 mg/dL; FT (P2) - 9.2; 8.6; 9.1; 8.7 and 8.4 mm, respectively for 0.0; 4.0; 8.0; 12.0 and 16.0% of SH inclusion. Results for finishing phase (46-d) were: ADFI - 2.53; 2.45; 2.48; 2.63 and 2.69 kg; ADG - 0.84; 0.79; 0.79; 0.86 and 0.88 kg; G:F - 2.99; 3.09; 3.13; 3.05 and 3.05; PUN - 8,65; 8,74; 9,04; 7,79 and 8,18 mg/dL; FT (P2) - 13.0; 11.7; 11.4; 11.2 and 11.6 mm. respectively at SH inclusion levels. No variable has been affected by SH inclusion. Results suggest that inclusion up to 16.0% of soybean hulls in growing and finishing pig diets is feasible.

Acknowledgements: UEM; UFSM

Key Words: By-Product, Feeding, Feedstuffs

M240 Hematology and blood biochemistry of Enviropig™. R. G. Meidinger[1], A. Ajakaiye*[1], D. A. Murray[1], S. P. Golovan[1], M. Z. Fan[1], J. P. Phillips[1], J. Zhang[1], R. R. Hacker[1], J. M. Kelly[2], and C. W. Forsberg[1], [1]*University of Guelph*, *Guelph, Ontario, Canada.*, [2]*MaRS Landing*, *Guelph, Ontario, Canada.*

Hematology and biochemistry of animal blood are well documented standard methods for assessing animal health. We have analyzed a total of 17 hematology and 25 biochemistry parameters on fresh blood samples to assess the health of the recently developed Enviropig™ (EP) Cassie line of pigs that secretes phytase in the saliva. Forty eight pigs (24 EP and 24 Yorkshire [YK]) comprised of 12 boars and 12 gilts of each breed were used in the trial, with blood collected at 54.6 ± 0.7 and 55.7 ± 0.5, 90.6 ± 0.7 and 91.7 ± 0.5 and 125.6 ± 0.7 and 126.7 ± 0.5 days of age for weanling, growing and finishing phases, respectively. Growing and finishing pigs were individually housed in a temperature-controlled room maintained at 22°C. The experimental design was 2 x 2 factorial combinations of breed and gender. All growing and finishing pigs were fed at a percentage of their BW with weekly adjustments using the NRC (1998) model. The experimental diets for the growing and finishing pigs were formulated based on the available P with the Ca:P maintained at a ratio of 2:1. Blood samples were collected from the intraorbital sinus. There were either no significant differences in the assayed parameters across the treatments (P<0.05), but if there were differences, the values were within published normal ranges. These data indicate no appreciable biological differences between the EP and YK hematology and blood biochemistry.

Key Words: Enviropig™, Yorkshire, Blood

M241 Effects of feeding grains naturally-contaminated with *Fusarium* mycotoxins to first parturition sows on pre-parturition performance and metabolism. G. Diaz-Llano* and T. K. Smith, *University of Guelph*, *Guelph, Ontario, Canada*.

Fusarium mycotoxins such as deoxynivalenol (DON) and fusaric acid (FA) depress average daily feed intake (ADFI) and average daily gain (ADG) but do not affect gain:feed ratio (GF) of piglets. There is a lack of imformation concerning the effects of feeding sows grains naturally-contaminated with *Fusarium* mycotoxins. An experiment was conducted, therefore, to characterize the toxicity to first parturition sows and to determine the efficacy of a polymeric glucomannan mycotoxin adsorbent (GMA). Thirty first parturition sows were fed corn, wheat and soybean meal based gestation diets over three weeks prepartum. The diets included: (1) control (2) contaminated grains and (3) contaminated grains + 0.2% GMA. Diets had no effects on ADFI, however, the feeding of contaminated grain compared to controls reduced ADG ($P < 0.05$). There were no differences in ADG comparing controls and sows fed GMA. The G:F ratio was not affected by diet. There were no effects of diet on serum concentrations of B-OH butyrate, haptoglobin, total protein, albumin, globulin, albumin: globulin ratio, urea, creatinine, glucose, cholesterol, or on activities of alkaline phosphatase, gamma glutamyltransferase, aspartate aminotransferase, creatine kinase, glutamate dehydrogenase, total bilirubin, conjugate bilirubin and free bilirubin. There were no effects of diet on body weight of piglets at birth, nor on the number of piglets born alive, stillborns, mummies and total born. It was concluded that the feeding of diets containing grains naturally contaminated with *Fusarium* mycotoxins to first parturition sows during prepartum period affects ADG. Supplementing contaminated diets with GMA prevents this effect of mycotoxins.

Key Words: Sows, *Fusarium*, Mycotoxin

M242 Effects of feeding grains naturally-contaminated with *Fusarium* mycotoxins to first parturition sows on post-parturition performance and metabolism. G. Diaz-Llano* and T. K. Smith, *University of Guelph*, *Guelph, Ontario, Canada*.

Fusarium mycotoxins such as deoxynivalenol (DON) and fusaric acid (FA) depress average daily feed intake (ADFI) and average daily body weight change (ADBWC) but do not affect gain: feed ratio (GF) of piglets. There is a lack of information relating to the effects of feeding sows grains naturally-contaminated with *Fusarium* mycotoxins. An experiment was conducted, therefore, to characterize the toxicity to first parturition sows during the lactation period and to determine the efficacy of a polymeric glucomannan mycotoxin adsorbent (GMA). Twenty one first parturition sows were fed corn, wheat and soybean meal based lactation diets over three weeks prepartum and three weeks after farrow. The diets included: (1) control (2) contaminated grains and (3) contaminated grains + 0.2% GMA. The feeding of contaminated diets after farrowing reduced ADFI ($P < 0.01$) and ADBWC ($P < 0.05$) compared to controls. Feeding of the GMA diet reduced ADFI ($P < 0.01$) but not ADBWC compared to controls ($P = 0.074$). There were no effects of diet on serum concentrations of B-OH butyrate, haptoglobin, blood protein, albumin, globulin, albumin: globulin ratio, urea, creatinine, glucose, cholesterol, nor on activities of alkaline phosphatase, gamma glutamyltransferase, aspartate aminotransferase, creatine kinase, glutamate dehydrogenase, total bilirubin, conjugate bilirubin and free bilirubin the day of farrowing. Body weight gain of piglets to weaning was not affected by diet. Protein, fat and lactose concentration in milk was not affected by diet on the day of farrowing or during lactation. It was concluded that feeding first parturition sows diets containing grains naturally contaminated with *Fusarium* mycotoxins reduces ADFI during the lactation period.

Key Words: Sows, *Fusarium*, Mycotoxins

M243 Changes in dietary preferences in piglets due to different cereals. D Solà-Oriol[1], E Roura*[2], and D Torrallardona[1], [1]*IRTA-Centre de Mas Bové*, *Reus, Spain*, [2]*Lucta SA*, *Barcelona, Spain*.

Piglets at weaning undergo a severe reduction in dry matter intake due to low voluntary feed intake. The use of palatable diets during this phase should diminish this negative effect. Three trials were conducted to evaluate the palatability of different cereals compared to a basal diet with 60% of broken rice (reference). For each trial 36 four piglet pens had available simultaneous access to two different diets in two feeding hoppers; one with the reference diet and the other with the same diet but with partial (30%) or total (60%) substitution of the broken rice by a test cereal. In each trial three cereals were tested and a double control test (rice *vs.* rice) was included. The cereals were tested in mash form in two consecutive 4-day periods; the first period for the 30% inclusion level and the second period for the 60%. The preference for each cereal diet relative to the reference diet was calculated as the percentage contribution of the test diet to total feed intake. Preference values for all three trials were analyzed taking into account the effects of cereal, level of inclusion and their interaction. At 30% of inclusion, the preference values (% of total feed intake) were; broken rice (control): 51^{a}, barley: 47^{ab}, rye: 45^{abc}, wheat: 39^{abcd}, maize (Argen-

tina): 31^{bcde}, biscuit by-product: 31^{bcde}, cassava: 30^{bcde}, maize (Europe): 29^{bcdef}, sorghum: 27^{cdefg} and oats: 18^{efgh}. When included at 60%, the preferences were: broken rice (control): 47^{a}, rye: 29^{bcdef}, barley: 22^{defg}, cassava: 22^{defg}, wheat: 22^{defg}, biscuit by-product: 18^{efgh}, maize (Europe): 11^{fgh}, sorghum: 11^{fgh}, maize (Argentina): 8^{gh} and oats: 3^{h}. Values with different superscripts are significantly different ($P < 0.05$); pooled SEM=6.6. It is concluded that the palatability of the diet for piglets depends on the source of cereal used and its level of inclusion.

Key Words: Piglet Weaning, Diet Preference, Cereals

M244 Changes in dietary preferences in piglets due to different protein sources. D Solà-Oriol[1], E Roura*[2], and D Torrallardona[1], [1]*IRTA-Centre de Mas Bové*, *Reus, Spain*, [2]*Lucta, SA*, *Barcelona, Spain*.

Voluntary feed intake in piglets depends on the palatability of the diet. Two trials were conducted to study the effects of different protein sources on diet palatability in piglets. A double choice preference test was performed using a reference basal diet with 20% of a soy protein product (56% CP -SBM-56-) low in anti-nutritional factors. 36 four-piglet pens were offered free access to two different diets in two feeding hoppers; one of which contained the reference diet and the other contained the diet with the protein source to be tested. The tested protein sources were included in the diets at two levels (10 and 20%) replacing the corresponding amount of soy protein product from the basal diet. Each trial included a double control test (SBM-56 *vs.* SBM-56) and the diets were presented in mash form. The tests were performed in two consecutive periods of 4 days, first period to test the 10% and second period to test the 20% inclusion levels. The preference for each protein source relative to the reference diet was calculated as the percentage contribution of the test diet to total feed intake. The preference values of both trials were analyzed together taking into account the effects of ingredient, level of inclusion and their interaction. When included at a level of 10% the preference values (% of total feed intake) observed were: lupine (*L. angustifolius*): 70^{a}, soybean meal-44: 69^{ab}, extruded soybean: 68^{ab}, soybean meal-48: 62^{abc}, SBM-56 (control): 54^{abcd}, sunflower meal: 40^{de} and rapeseed meal: 30^{ef}. On the other hand, when included at 20% they were: soybean meal-44: 55^{abcd}, soybean meal-48: 54^{abcd}, SBM-56 (control): 54^{abcd}, extruded soybean: 53^{bcd}, lupine (*L. angustifolius*): 47^{cde}, rapeseed meal: 10^{fg} and sunflower meal: 9^{g}. Values with different superscripts are significantly different ($P < 0.05$); pooled SEM=7.5. It is concluded that the source of protein and its level of inclusion affect the palatability of piglet diets. Sunflower and rapeseed meals showed the lowest preferences.

Key Words: Piglet, Diet Preference, Protein Sources

M245 Litter size of naturally bred and artificially inseminated sows from commercial swine production units in North-Central Mexico. L. A. Ruvalcaba, F. De la Puente-Ocampo, F. J. Escobar-Medina*, and C. F. Arechiga, *Universidad Autonoma de Zacatecas*, *Zacatecas, Zac. Mexico*.

Litter size from naturally bred (n=48), inseminated (n=64) and gonadotropin-treated and inseminated (n=37) sows from commercial swine units was evaluated. Sows parity was not alloted. Natural breeding and heat detection for insemination depended upon owner and/or manager's decission. Therefore, inseminations were performed by the same technician in a daily schedule for each farm (every 24 hours) based on heat information provided by the farm personnel. Total number of pigs born did not show differences within inseminated, gonadotropin-treated prior to insemination and naturally breeding. However, there was a tendency for higher number of piglets in multiparous than primiparous sows. Moreover, there were no significant difference in the number of piglets born alive and the number of pigs weaned, but there were differences between multiparous and primiparous sows using artificial insemination and natural breeding ($P < 0.05$). In conclusion, use of artificial insemination did not compromise litter size as compared to natural breeding in swine commercial units from North-Central Mexico.

Key Words: Sows, Artificial Insemination, Litter Size

M246 Reproductive function of sows inseminated using diluted semen in Androhep EnduraGuard and Androhep Plus. M. E. Vergara-Zambrano, F. J. Escobar-Medina*, J. Becerril-Ángeles, G. Rocha-Chavez, and F. De la Colina, *Universidad Autonoma de Zacatecas*, *Zacatecas, Zac. Mexico*.

A study concerning the reproductive behavior of sows served with dilluted semen in Androhep Plus stored during 1 to 3 days (group 1); Androhep EnduraGuard stored during 1 to 3 days (group 2) and 7 to 9 days (group 3) is described. The semen was stored at 17° C. Study was made in a commercial farm located a 22° 21′ N and 102° 02′W. Sows received only one artificial insemination. Percentage of conception was 82.56, 88.10 and 81.54%, and farrowing rates were 74.42, 79.76 and 76.92% in groups 1, 2 and 3, respectively. Litter size obtained was 9.7±3.8, 10.8±2.7 and 9.7±3.2 piglets of which 8.69±3.2, 10.0±2.5 and 8.82±2.9 were borne-alive in groups 1, 2 and 3, respectively. Treatment in group 2 (Androhep EnduraGuard 1-3 d), showed statistical significant difference in the number of piglets born alive compared to the other treatments. In conclusion, semen diluted in Androhep EnduraGuard stored during 7 to 9 days could be an alternative option to be used for artificial insemination of sows.

Key Words: Sows, Semen, Artificial Insemination

M247 Body-weight gain of piglets according to birth timing, mammary gland selection and litter size. M. G. Correa-Aguayo, F. J. Escobar-Medina*, and J. J. Hernandez-Berumen, *Universidad Autonoma de Zacatecas*, *Zacatecas, Zac. Mexico*.

Body weight of piglets was evaluated in response to birth sequence, litter size and mammary gland chosen (teat). Body weights were recorded weekly from birth to weaning at 4 wk of age. Recordings of mammary glands from which each piglet nursed were taken. There were not significant differences for daily weight-gain of piglets according to the locasion of the mammary gland. Sequence of birth and mammary gland chosen did not compromise body weight of piglets. However, there was a tendency for lower body weights in piglets born at the 11th, 12th and 13th place as well as for piglets nursing from inguinal teats. Piglets nursing from anterior mammary glands (from pair number 1 to pair number 6) tended to grow faster than piglets nursing from posterior mammary glands (from pair 7 and above). Litter size influenced daily weight-gain of piglets ($P < 0.05$). Litters with 3, 4, 5, and 7 piglets showed higher body weights. Litter weight-gain was related to number of piglets; a litter size of 11 pigs showed the highest body weight ($P < 0.05$). In conclusion, there is a tendency for lower body weights in piglets born by the end of parturition. Individual daily weight-gain for piglets nursuring from anterior mammary glands is greater than for piglets nursuring from posterior mammary glands, as well as for piglets born from a reduced litter size. As expected, litter weight-gain increased as litter size increased.

Key Words: Swine, Mammary Gland, Litter Size

M248 Fertility of artificially-inseminated sows presenting abnormal vaginal secretions. F. Medina-Jimenez[1], F. J. Escobar-Medina*[1], C. F. Arechiga[1], J. J. Hernandez-Berumen[1], G. Rocha-Chavez[2], and J. Becerril[2], [1]*Universidad Autonoma de Zacatecas*, *Zacatecas, Zac. Mexico.*, [2]*Minitube Mexico*.

Fertility of artificially-inseminated sows presenting abnormal vaginal discharges was evaluated. Study include F1 sows (Landrace x Yorkshire, n=235) with different age, parity, body weight and body condition. Sows were divided into two groups having or not having abnormal vaginal secretions, detected during routine revisions of estrus or by observing purulent material on the catheter after insemination. In addition, sows were grouped according to the extender used to preserve semen: Androhep Plus with service from one to three days after the collection and dilution of semen and EnduraGuard with service from one to

three days and from seven to nine days after the collection and dilution of semen. There were statistical significant difference among extenders. EnduraGuard with service from one to three days obtained higher litter size and number of piglets born alive ($P \leq 0.05$). On average, 86.8% and 78.9% of the females conceived and 78.6% and 73.7%, farrowed in the groups with normal and abnormal vaginal secretion, respectively. These numbers were not significantly different. There were no interaction within extender used and sows with or whitout abnormal vaginal secretion. The average litter size, in the same order, was 10.24 ± 3.0 and 9.88 ± 2.8 ($P \leq 0.01$), and the number of piglets born alive were 9.34 ± 2.8 and 8.92 ± 2.8 ($P \leq 0.01$). In conclusion, presence of abnormal vaginal secretions by the time of insemination might not severely compromise fertility and other reproductive parameters of the sows.

Key Words: Swine, Artificial Insemination, Vaginal Secretion

M249 Effect of gender, group size, and time of first removal for slaughter on pig performance in a wean-to-finish production system. J. M. DeDecker*, M. Ellis, C. R. Bertelsen, B. A. Peterson, and M. J. Ritter, *University of Illinois*, *Urbana*.

This study was carried out with 1326 crossbred pigs to investigate the effects of gender, group size, and timing of pig removal for slaughter on pig performance. A randomized complete block design was used with a 3×2×2 factorial arrangement of treatments:1) gender (barrow vs gilt vs mixed-gender pens), 2) group size (42 [floor space 0.54m2/pig] vs 36 [0.63m2/pig] pigs/pen), and 3) time of first removal for slaughter (18 vs 20 wk post-weaning). For the wk-18 treatment, 15% of the heaviest pigs were removed at wk 18, 25% at wks 20 and 22, and remaining pigs at wk 24; for the wk-20 treatment, 25% of the heaviest pigs were removed at wks 20 and 22, and the remaining pigs at wk 24. Growth was measured from 19.3 ± 0.01kg to 104.5 ± 0.59kg (Period 1, before removal) and from 104.5 ± 0.59kg to 131.4 ± 0.84kg (Period 2, wk 18 to 24 post-weaning). No treatment interactions were found. For Period 1, ADG was greater ($P < 0.01$; 897 and 876 g/d) and BW higher ($P < 0.05$; 105.3 and 103.7) for 36 and 42 pig groups, respectively; ADFI and G:F were not affected by group size. The CV for BW was higher ($P < 0.05$) at wk 18 for 42 pig groups compared to 36 pig groups (13.4 vs 12.0%, respectively). In Period 2, 36 pig groups had higher ($P < 0.01$) ADFI, lower ($P < 0.01$) G:F, but similar ADG than 42 pig groups. Removing pigs at wk 18 versus wk 20 resulted in higher ($P < 0.001$) ADG and ADFI for the remaining pigs, but had no affect on G:F. Barrow and mixed-gender groups had higher ($P < 0.05$) ADFI but lower ($P < 0.05$) G:F than gilts. The 42 pig groups compared to the 36 pig groups produced more total live weight ($P < 0.001$; 4359.6 and 4868.3 ± 65.36kg, respectively), consumed more feed/pen ($P < 0.01$; 8940.3 and 9949.1 ± 210.58kg, respectively), and had greater ($P < 0.01$) variation in BW for all pigs marketed. Variation in BW for all pigs marketed was higher ($P < 0.01$) for the wk 20 than the wk 18 treatment. In summary, the 42 pig groups grew slower but produced a greater total weight of pigs than 36 pig groups. Removing pigs at wk 18 compared to wk 20 improved the growth rate of the remaining pigs and resulted in lower variation in BW at market.

Key Words: Pigs, Group Size, Pig Removal

M250 Estimation of carcass compositional differences in live breeding swine using real-time ultrasound. T. Perkins*, *Southwest Missouri State University*, *Springfield*.

The use of ultrasound to estimate backfat thickness and loin muscle area has been documented as far back as the 1950's in swine research. However, the introduction of B-mode ultrasound has improved the accuracy of determining live animal composition. The objectives of this study were to determine carcass compositional differences and to estimate percent lean in seedstock swine using real-time ultrasound. Progeny seedstock boars (n = 543) from thirty different purebred Duroc sires were ultrasounded to determine backfat thickness and longissimus muscle area for estimation of percent lean in live seedstock boars. An Aloka 500V real-time ultrasound unit, equipped with a 17.2 cm transducer, was used to collect images for determination of the carcass attributes. Backfat thickness and loin muscle area was measured from a single cross-sectional image at the 10th rib. Individual liveweight was taken on each animal prior to scanning. Averages for scan age (DOA), scan weight (SWT), backfat thickness (BF10), loineye area (LEA) and percent lean (%Lean) were 166 d, 116.1 kg, 1.0 cm, 47.93 cm^2 and 59.3%, respectively. The correlation coefficients between SWT and BF10, SWT and LEA, and SWT and %Lean were 0.46, 0.62 and -0.40, respectively. Results from this study suggest that real-time ultrasound can be used to determine carcass attribute differences in Duroc seedstock boars. Accurate and reliable estimates of carcass composition in breeding stock are necessary for increased genetic improvement. Costly and time consuming harvest of progeny has been used for carcass data collection in the past. However, this study suggests that this may be an unnecessary production cost for seedstock swine producers.

Key Words: Carcass, Boars, Ultrasound

M251 Efficacy of two natuaral additives, SUPROL® and RepaXOL® as growth promotants for grow-finish pigs. R. Thaler[1], B. Rops[1], B. Christopherson*[2], and E. Cerchiari[3], [1]*South Dakota State University*, *Brookigns*, [2]*SODA Feed Ingredients LLC*, *Brookings, SD*, [3]*SODA Feed Ingredients Ltd.*, *Ireland*.

One hundred high lean-gain barrows weighing approximately 23 kg were utilized in a grow-finish trial to determine the efficacy of SUPROL® and RepaXol® as growth promotants. SUPROL® is a microencapsulated mixture of organic acids and essential oils that is used as a natural growth promotant, RepaXol® is a mixture of essential oils protected by a double coating process and both are natural growth promotants. Five dietary treatments were used (Control (Con); Con + SUPROL®; Con + RepaXol®; Con + Tylan; Con + Mecadox) in a 4-phase feeding program. There were 5 pigs/pen and 4 replicates/treatment. The trial was terminated at a final weight of 114 kg BW. From 23-36 kg (Grower 1), pigs fed either the RepaXol® or Mecadox diets gained faster ($P < 0.05$) and consumed more feed ($P < 0.05$) than pigs fed the rest of the diets, but there were no differences in G:F between any of the treatments. For the Grower 2 phase (36-59 kg), the only differences observed were that pigs on the Mecadox treatments consumed more feed ($P < 0.05$) than pigs fed the other dietary treatments, and gained faster than pigs fed the Suprol® diet ($P < 0.05$). For the Finisher 1 (59-86 kg) period, there were no differences in performance, but in the Finisher 2 (96-114 kg) period, pigs fed Tylan diets were more efficient than pigs receiving Mecadox diets ($P < 0.05$). In the overall period from 23-114 kg BW, daily gain, feed intake, and feed efficiency were unaffected by treatment.

Key Words: RepaXOL®, SUPROL®, Organic Acids