

samples were collected once weekly prepartum, at days 3, 0, and +3 relative to calving, and twice weekly postpartum. Plasma were analyzed for triglycerides (TG), total cholesterol, lipoprotein cholesterol and fatty acids. Changes in plasma lipid concentrations during the periparturient period were characterized for the first time. Plasma lipid concentrations were not affected by feeding rumen-protected choline. Cows fed SB beginning at 28 days prepartum had higher plasma TG, cholesterol, lipoprotein cholesterol, and fatty acid concentrations than cows fed the control diets during the prepartum period. By 14 days postpartum, cows fed SB beginning at parturition had similar plasma lipid concentrations as cows fed SB prepartum. If increased plasma lipid concentrations have reproductive advantages, feeding SB beginning 28 days prepartum as well as at parturition are equally effective in improving lipid balance during early lactation.

Key Words: Transition Cows, Lipid Profiles, Rumen-Protected Choline

856 Effects of physiological state, prepartum dietary carbohydrate source, and chromium supplementation on dynamics of insulin, glucose, and fatty acid metabolism in dairy cows. K. L. Smith*¹, M. R. Waldron¹, T. R. Overton¹, J. K. Drackley², R. C. Boston³, and M. T. Socha⁴, ¹Cornell University, Ithaca, NY, ²University of Illinois, Urbana, ³University of Pennsylvania, Kennett Square, ⁴Zinpro Corporation, Eden Prairie, MN.

Holstein cows (n=72) entering second or later lactation were used to determine whether glucose tolerance test (GTT) indices were affected by source of carbohydrate in the prepartum diet, chromium-L-methionine (Cr-Met) supplementation throughout the periparturient period, and physiological state. Cows were fed a TMR with concentrates consisting of either starch-based cereals (high NFC; 40.3% NFC) or nonforage fiber sources (low NFC; 33.6% NFC) from 21 d before expected parturition until parturition; cows were fed a common diet postpartum. The Cr-Met was supplemented once daily via gelatin capsule at dosages of 0, 0.03, or 0.06 mg of Cr per kilogram of BW^{0.75}. Thus, treatments were in a 2 (carbohydrate source) x 3 (Cr-Met) factorial arrangement. The GTT were conducted on d 10 prior to expected parturition and d 28 postpartum and on a subset (n = 13) of cows on d 5 postpartum. The GTT indices were derived using the Minimal Model and other indices were calculated using Stata. The SI (insulin sensitivity), SG (glucose effectiveness), and DI (disposition index) were lower (P < 0.001) and AIRg (acute insulin response to glucose) was higher (P < 0.001) during the prepartum period compared to the postpartum period. The lipolysis rate (FFAslope) was lower (P < 0.001) during the prepartum period. Feeding diets containing low or high concentrations of NFC during the prepartum period resulted in no significant effects on any of the kinetic indices derived from the GTT. Administering increasing amounts

of Cr-Met linearly increased (P < 0.001) AIRg. These data support the concept that increased insulin resistance during late pregnancy is mediated through decreased insulin sensitivity, and that effects of prepartum dietary carbohydrate source and Cr-Met on tissue responsiveness to insulin are modest.

Key Words: Periparturient Cow, Chromium, Glucose Tolerance Test

857 Inducing hypocalcemia in rumen fistulated steers to determine effectiveness of anionic salt treatments for transition dairy cattle. M. A. Froetschel*¹, D. Kumar¹, P. G. Smith¹, and S. N. Nichols², ¹The University of Georgia, Athens, ²West Central Soy, Ralston, IA.

Eight rumen-fistulated Holstein steers, 4 yearling (Y: 417 ± 10.4 kg) and 4 mature (M: 632.8 ± 54.6 kg), were fed a control diet (C) or three cation-anion difference (DCAD) products: Soy-Chlor 16-7 (S), Bio-Chlor (B) or Animate (A) in a replicated 4 X 4 Latin Square. Sodium bicarbonate (1%) was added to C to make it positive in DCAD. Total mixed rations, 65% concentrate and 35% chopped Bermudagrass Hay, were fed 1X/d. During experimental periods, steers were fed C for 3 d and experimental diets for 11 days. On d 13 and d 14, Y and M steers, respectively, were fit with 2 indwelling jugular catheters. In one, Na-EDTA was infused (5% wt/wt at 6.5ml/min for 5-7 h) and in the other, blood was sampled (at 30 min intervals, 2 before and 12 during EDTA infusion). Intake and urine pH (UPH) were measured daily and reticulorumen motility (RRM), UPH, urine and blood ionizable-calcium (UCA and BCA) were measured before and during IV Na-EDTA infusion. Intake (DMI) and UPH decreased by feeding DCAD. DMI was 29.0, 23.9, 25.2 and 25.4 ± 1.22 kg/d, and UPH was 8.10, 6.62, 6.61 and 6.98 ± .14 for steers fed C, S, B and A. DMI as a % of BW was 2.55, 2.09, 2.25 and 2.28 ± .1. DCAD effects on BCA during EDTA infusion depended on maturity. BCA was 5.54, 5.94, 6.89 and 6.67 mg/dL ± .22 and was 57.6, 62.6, 66.1 and 65.8 ± 1.0 % of pre-infusion BCA (10.1 ± .15 mg/dL) during EDTA (2 to 5 h), for Y steers fed C, S, B and A. BCA averaged 7.17, 6.87, 5.92 and 6.58 ± mg/dL, during EDTA (2 to 5 h), for M steers and was 70.9 % of pre-infusion BCA (9.24 ± .22 mg/dL). During EDTA infusion, frequency of RRM increased in Y but decreased in M steers fed DCAD. Prior to EDTA infusion, UCA was higher in steers fed DCAD (4.38, 29.0, 29.1 and 9.41 ± 2.4 mg/dL for C, S, B and A). During the first 2 h of EDTA, UCA decreased but was still higher in DCAD steers. After 1 h of EDTA, UCA was .4, 18.8, 13.1 and .4 ± 2.4 mg/dL for steers fed C, S, B and A. After 3 h of EDTA, UCA was not detectable. Inducing hypocalcemia with EDTA, especially in yearling steers, was useful to demonstrate efficacy of DCAD products.

Key Words: Hypocalcemia, DCAD, Calcium

Swine Species

858 Gilt selection for improved lifetime productivity. J. L. Patterson*¹, G. R. Foxcroft¹, M. J. Pettitt², and E. Beltrarena¹, ¹Swine Research & Technology Centre, Edmonton, AB, Canada, ²Prairie Swine Centre Inc., Saskatoon, SK, Canada.

In a study of 509 pre-pubertal C22 and L42 (PIC Canada) gilts given direct daily boar contact from 140.1 ± 5.1 d of age, and classified with respect to age at first estrus as Early (148.0 ± 0.5 d), Intermediate (159.8 ± 0.4 d) or Late (175.7 ± 0.5 d) responders, or as Non-Responsive (NR; not cyclic by 180 d), earlier responding gilts accumulated less non-productive days (NPD) in the gilt pool (J. Anim. Sci. Vol 81, Suppl 1). Data on reproductive performance of these gilts until either culling or farrowing as third parity sows is now available to evaluate longer-term productivity. The main differences detected were between any gilt recorded as initially responding to boar contact (R) compared to NR gilts. Analyzed on the basis of overall performance of gilts originally on inventory, R were more productive than NR gilts (P #8804 0.01), as measured by the percentage of gilts successfully bred (R = 96.2 vs. NR = 75.2 %), farrowing one (R = 85.0 vs. NR = 64.2 %), two (R = 72.2 vs. NR = 49.5 %), or three litters (R = 57.6 vs. NR = 37.0 %), and as the average litters produced per gilt on inventory (R = 2.5 ± 0.1 vs. NR = 1.7 ± 0.1 litters), reflecting a lower retention rate of NR gilts in the breeding herd. When different gilt categories were compared on the basis of productivity of sows that actually produced litters, sow NPD were higher (P #8804 0.05) in NR compared to R females, as measured by average weaning-to-estrus interval (6.4 ± 0.4 vs. 5.6 ± 0.2 d, respec-

tively) and weaning-to-conception interval (11.2 ± 1.3 vs. 7.5 ± 0.6 d, respectively). In contrast, mean total pigs born per litter at first, second and third parity was not different (P #8805 0.05) between R(10.7 ± 0.4, 11.2 ± 0.4 and 12.5 ± 0.5, respectively) and NR (10.9 ± 0.2, 11.3 ± 0.2 and 12.1 ± 0.2, respectively) gilts. Gilt selection based on recorded first estrous during periods of good boar contact (heat-no-serve) is therefore predictive of better lifetime reproductive performance.

Key Words: Gilts, Selection, Lifetime Productivity

859 Efficient sows are good mothers. R. Bergsma*, IPG, Institute for Pig Genetics, AA Beuningen, The Netherlands.

Feed intake of sows during lactation is often too low. Increasing feed intake capacity of sows is one solution, increasing feed efficiency another. The aim of this study was to investigate the sources of variation in feed efficiency during lactation. Specifically, the ratio between output (energy gain of weaned and died piglets during lactation) and input (energy from feed intake and body tissue losses corrected for maintenance) was examined. Data were collected on the experimental farm of IPG in Beilen, The Netherlands. Sows were weighed and backfat was measured ultrasonically when sows entered the farrowing house and again at weaning. Piglets were weighed at birth and at weaning. Cross fostering, mortality of piglets and lactation feed intake of sows was recorded. Lactations of three sow genetic lines (CROSS) of different parities were

investigated, resulting in 250 records. The table shows that the 50% most efficient sows produced 30 % extra output at similar level of input. The relation between output and input was not linear, but of diminishing-returns. Efficient sows were better mothers because the mortality among their piglets was lower and litter weight at weaning increased. The Efficient sows had reduced feed intake and increased body tissue losses. Significance levels were estimated using the model: $Y_{ijklm} = \mu + \text{PARITY}_i + \text{BATCH}_j + \text{CROSS}_k + \text{EFFICIENCY}_l + e_m$. For the traits weight loss, piglet survival and output, a quadratic function of input was added to the model. It was concluded that sow feed intake efficiency is a trait to take into account in studies of fertility. Current work focuses on the potential to select sows with similar feed intake and body condition losses and considerably higher output in terms of survival and piglet weight gain.

	50 % Least efficient sows	50 % Most efficient sows	
Input (MJ/d)	58.4	56.0	n.s.
Output (MJ/d)	23.9	29.9	**
Net weight start lactation (kg)	235	233	n.s.
Piglet survival (%)	79.6	88.7	**
Litter weight at weaning (kg)	73.3	84.2	**
Lactation feed intake (kg)	142.2	131.3	**
Body weight losses (kg)	11.4	15.9	**

** : $p < 0.01$; n.s. not significant.

Key Words: Pigs, Lactation, Feed Efficiency

860 Comparison of different measures of carcass composition and lean growth in swine. D. W. Newcom¹, K. J. Stalder^{*1}, and G. F. Jones², ¹*Department of Animal Science, Iowa State University, Ames, IA*, ²*Department of Agriculture, Western Kentucky University, Bowling Green.*

Data from 174 pigs from two years of the Southern Kentucky Market Hog Derby Show were utilized for this study to investigate five measures of carcass composition and their impact on estimated lean growth rate. Pigs were weighed on-test at a centralized location and final off-test weights were obtained at the show. Pigs were transported to a major packing facility (Swift, Inc., Louisville, KY) for harvest. Plant employees measured midline backfat depth at the last rib location 45 m post-mortem. At 6 h post-mortem, the carcasses were ribbed and backfat was measured off-midline at the 10th rib (BF). Last rib backfat (LRBF) was measured on the split carcasses. The 10th rib loin muscle area (LMA) was traced onto acetate paper. The LMA was measured on the carcass and the tracing with a plastic grid, and on the tracing using a compensating polar planimeter. Two people made independent measurements with tolerance of 1.29 cm² permitted. Kilograms (WTL) and percent (%L) lean in the carcass and grams of lean gained per day on test (LG) were calculated from the three loin muscle area measures and the two

measures of LRBF. Data were analyzed using a linear model with treatment (method and location of measurement) and year included as fixed effects in all analyses. Off-test weight and BF were included as covariates in the LMA analysis. Off-test weight was included as a covariate in the WTL, %L, and LRBF analyses. On-test weight was included as a covariate for the LG analyses. The LMA measured directly on the carcass was the smallest of the three methods of measurement and was different ($P < 0.05$) from that measured with the polar planimeter. The grid measurement on the acetate paper was intermediate but not different from the other two measures. When estimating WTL, %L, and LG, the three measures of LMA were not different but were lower ($P < 0.05$) than those estimated from LRBF measures. In conclusion, different techniques for measuring LMA were different but had no impact on WTL, %L, or LG estimates.

Key Words: Swine, Composition, Lean Growth

861 Effects of removing different proportions of slaughter weight pigs from pens on subsequent growth performance. J. M. DeDecker^{*1}, M. Ellis¹, B. F. Wolter², and B. A. Peterson¹, ¹*University of Illinois at Urbana-Champaign, Urbana*, ²*The Maschhoffs, Inc., Carlyle, IL.*

Twenty-one pens of crossbred finishing pigs ($n = 651$) were used in a randomized complete block design to evaluate removing three different proportions (0, 10, and 20%) of the heaviest pigs from pens on subsequent performance over a 14-d period. Pens (31 pigs/pen; mean BW = 124.3 ± 1.09 kg) were randomly allocated to treatment, and the heaviest animals were removed as dictated by treatment. Floor and feeder spaces/pig were 0.69m² and 5.25cm, 0.76m² and 5.81cm, and 0.85m² and 6.50cm for the 0, 10, and 20% removal treatments, respectively. Two statistical analyses were conducted. The first compared performance of the entire groups of pigs after removal (31 vs 28 vs 25 pigs/pen for the 0, 10, and 20% removal treatments, respectively). The second analysis compared performance of the lightest 25 pigs in each treatment. ADG ($P < 0.05$; 872, 988, and 1,048 \pm 46.2g/d for 0, 10, and 20% removal treatments, respectively) and feed intake ($P < 0.001$; 2,848, 3,064, and 3,137 \pm 53.7g/d, respectively) increased linearly as the proportion of pigs removed increased. Feed efficiency was not affected ($P = 0.106$) by removal treatment. Comparing the lightest 25 pigs/pen across treatments, ADG increased linearly ($P < 0.05$; 847, 970, and 1,034 \pm 45.8g/d, respectively). The total live weight of pigs produced was similar ($P > 0.05$) across treatments (4,246, 4,256, and 4,243 \pm 37.3kg, respectively). However, the total feed consumed/pen during the study period decreased ($P < 0.001$) linearly as the proportion of pigs removed increased (1,222, 1,200, and 1,097 \pm 19.5kg, respectively). The within-pen coefficient of variation for the entire pen at d14 post-removal was similar ($P > 0.05$) among treatments (7.38, 6.73, and 6.88 \pm 0.419%, respectively). In summary, these results suggest that growth performance increases linearly as the proportion of pigs removed increases from 0 to 20%.

Key Words: Pigs, Removal, Proportions