Continuous milking (CM) of bST-supplemented primiparous cows results in production losses of 20 to 25%, suggesting mammary growth was inhibited. We hypothesized continuous (throughout late gestation and early lactation) bST supplementation and/or early-lactation increased milking frequency (IMF) would alleviate production losses in CM glands through improved mammary epithelial cell (MEC) functionality and proliferation. Primiparous cows were randomly assigned to either continuous bST (+bST; n = 4) or no bST (-bST; n = 4) treatment throughout the experiment. Within each animal, udder halves were randomly assigned to either CM or a 60-d dry period (CTL treatment). CTL halves were dried -60 d relative to expected parturition date. CM glands were milked twice daily until parturition or spontaneous dry-off. At parturition all cows were milked four times daily (4X) until 30 d postpartum. Time points for mammary biopsies averaged -19, -7, +2, +7, and +20 d relative to parturition. Average d dry for CTL glands was 59.5 and 49.3 d for 4X+bST and 4X-bST treatments. Prepartum half-udder milk yield was greater (P < 0.01) in +bST cows than -bST cows (11.7 vs. 9.2 kg/d). Postpartum milk yield was reduced (P < 0.01) in CM udder halves regardless of bST treatment (15.0 vs. 25.0 kg/d; CM vs. CTL). Milk composition (fat, protein, SCC linear score) was not affected by CM or bST. MEC proliferation (Ki67 antigen index) was greater (P < 0.01) in CTL glands at d -7 (6.2 vs. 3.4%, CTL vs. CM), but was not affected at d -19, +2, +7, or +20. MEC proliferation was unaffected by bST. Decreased milk yield in CM halves was not overcome by bST in primiparous cows milked 4X. Further, MEC proliferation was reduced in CM halves near parturition (+7 d).

Key Words: Continuous Milking, bST, Mammary Cell Proliferation

The anticancer effects of vaccenic acid in milk fat are due to its conversion to conjugated linoleic acid via Δ9-desaturase. A. L. Lock*, B. A. Cori†, D. E. Bauman†, D. M. Barbano*, and C. Ip*, 1Cornell University, Ithaca, NY, 2Roswell Park Cancer Institute, Buffalo, NY.

Cis-9, trans-11 conjugated linoleic acid (CLA) has been shown to be anticarcinogenic in a number of animal tumor models. Dairy products are the principal source of CLA in human diets and endogenous synthesis from vaccenic acid (trans-11 18:1; VA), the major biohydrogenation intermediate produced in the rumen, is the predominant source of CLA in milk fat. Foods rich in CLA are therefore also rich in VA. We previously reported that dietary VA caused a dose-dependent increase in the mammary gland level of CLA and reduced the risk of developing premalignant lesions, and tissues analyzed for fatty acids. Total premalignant lesions were 83, 80, 43 and 68 for treatment 1, 2, 3 and 4, respectively (P <0.05). In the same order, the CLA concentrations (g/100g fatty acids) in the mammary fat pad were 2.13, 2.14, 4.75 and 2.98, while the VA concentrations were 0.54, 0.74, 4.89 and 8.20 (P <0.001). Thus the feeding of VA increased mammary tissue level of CLA and reduced the risk of developing premalignant lesions in the mammary gland. Treatment with SO reversed the effects of VA. It is most likely that the anticarcinogenic effect of VA is mediated through its conversion to CLA via Δ9-desaturase, and when this conversion is blocked by sterellic oil, the biological response to VA is altered.

Key Words: Vaccenic Acid, Conjugated Linoleic Acid, Mammary Cancer

A new sow model to study amino acid arterio-venous differences and uptake by the mammary gland before and after farrowing. Z. Mroz*, W. Krasucki†, and S. J. Koopmans†, 1Wageningen University and Research Centre, Division Nutrition and Food, Lelystad, The Netherlands, 2Agricultural University of Lublin, Poland.

A new sow model was developed to study the post-absorptive kinetics of amino acids in the mammary gland during pre- and postfarrowing periods. For this purpose, six multiparous sows at late pregnancy were fitted with three blood catheters (A. epigastrica cranialis superficialis, A. ilaca externa, V. epigastrica cranialis superficialis) to measure: 1) arterio-venous differences (AVD), extraction rate (ER) and uptake of essential amino acids in the mammary gland, and 2) blood acid-base characteristics as affected by two factors - sampling time (pre-prandial versus post-prandial) and phase of the reproductive cycle (pre- and post- farrowing). The AVD, ER and amino acid uptake in the mammary gland of sows as affected by the post-farrowing phase are presented in Table 1. In general, we found that this new sow model can be useful for studying dynamics of essential amino acids uptake for colostrum or milk synthesis. Also, the requirement of the mammary gland in pregnancy and lactation for specific amino acids can be estimated.

Amino acid arterio-venous differences (AVD), extraction rate (ER) and amino acid uptake in the mammary gland of sows as affected by the post-farrowing phase

Nonruminant Nutrition: Sow Feeding

791 A new sow model to study amino acid arterio-venous differences and uptake by the mammary gland before and after farrowing. Z. Mroz*, W. Krasucki†, and S. J. Koopmans†, 1Wageningen University and Research Centre, Division Nutrition and Food, Lelystad, The Netherlands, 2Agricultural University of Lublin, Poland.

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Amino acid arterio-venous differences (AVD), extraction rate (ER) and amino acid uptake in the mammary gland of sows as affected by the post-farrowing phase
The objective was to validate the ideal dietary amino acid pattern in lactation diets to improve the performance of primiparous sows during lactation. Twenty four primiparous sows (Camborough-22, PIC) and their litters were used for this study. On d 109 of gestation, sows were allotted to one of four dietary treatments representing: low protein (LC), low protein with ideal protein (LI), high protein (HC), and high protein with ideal protein (HI). Low protein diets contained 17.5% CP and high protein diets contained 19.5% CP. Ideal amino acid patterns among lysine, threonine, and valine were 100:63.0:78.1 for the LI diet when it was calculated based on ileal digestibility. Among lysine, threonine, and valine were 100:63.0:78.1 for the LI diet and 100:62.3:77.5 for the HI diet when it was calculated based on ileal digestibility. The ADG of conceptus, fetal litter, individual fetus, entire mammary gland, and crude protein in fetal litter were significantly different before and after d 70 of gestation. The protein daily gain from all the maternal and fetal tissues was 40 g/d before d 70 of gestation and 103 g/d after d 70 of gestation suggesting that pregnant gilts may require different amounts of dietary protein during gestation. Considering the needs of maternal and fetal gains as well as maintenance, we suggest that the diet of pregnant gilts should provide 6.8 g/d (or 147 µmol/L) of ER (%) during gestation. Dry matter was lower in XT sows (d0: 94 v 106mg/ml, P<0.01) but fat and protein concentrations did not differ. Milk IgG was lower in XT sows (d0: 94 v 106mg/ml, P<0.01, SEM=0.02). Piglet pre-weaning gain was not affected by sow treatment. However in the distal small intestine, villus height was greater in pigs sucking XT sows (413 v 312µm, P<0.05, SEM=32) and villus-crypt surface area was higher (165 v 194µm² x10⁶, P<0.1, SEM=14). Reduced P2 loss in XT sows and increased milk lactose suggest an effect on nutrient partitioning. Lower milk IgG levels may indicate decreased immune stimulation due to reduced microbial challenge in XT sows. Changes in piglet gut morphology were not reflected in performance but may indicate a carry-over from sow to piglet in the XT group.

Key Words: Plant Extracts, Lactation, Piglet

795 Comparison of ad-libitum and hand-fed sow lactation feeders. J. Peng¹, S. Somes, D. Kirkpatrick, A. Sneeder, and D. Rozeboom, Michigan State University, East Lansing.

A study was conducted to compare the performance of lactating multiparous sows when feed was made available to them using either a hand-fed (HF) or ad libitum (AL) feeder. Both feeders were made of stainless steel and mounted to the head-gates of individual farrowing crates. Sow head space was similar. The bottom of the HF feeder was rounded, whereas the bottom of the AL feeder included a flat surface area, located below a plastic hopper and sow-operated dispensing mechanism, and a shallow bowl area, located below a water nipple. Water for HF sows was provided using a nipple-cup combination independent of the waterer. Milk IgG was lower in XT sows (d0: 94 v 106mg/ml, P<0.01, SEM=5.9; d21: 0.65 v 0.72mg/ml, P<0.1, SEM=0.02). Piglet pre-weaning gain was not affected by sow treatment. However in the distal small intestine, villus height was greater in pigs sucking XT sows (413 v 312µm, P<0.05, SEM=32) and villus-crypt surface area was higher (165 v 194µm² x10⁶, P<0.1, SEM=14). Reduced P2 loss in XT sows and increased milk lactose suggest an effect on nutrient partitioning. Lower milk IgG levels may indicate decreased immune stimulation due to reduced microbial challenge in XT sows. Changes in piglet gut morphology were not reflected in performance but may indicate a carry-over from sow to piglet in the XT group.


± 0.3 kg) and litter wt gain from d 3 until weaning (42.7 ± 2.0 vs. 39.2 ± 2.2 kg) were greater (P < 0.01) with AL feeders than with HF feeders, respectively. Number of pigs weaned did not differ (P > 0.05, 9.7 ± 0.1). The AL sows tended to have greater (P = 0.07) wt gains during lactation (12.2 ± 3.1 vs. 8.2 ± 3.2 kg, AL and HF, respectively). Backfat change during lactation and wean-to-estrus interval did not differ (P > 0.05). Sows with AL feeders wasted less (P < 0.01) water than sows with HF feeders (12.7 ± 14.8 vs. 236.0 ± 20.7 kg, respectively), but water intake and feed waste was similar (P > 0.05). Sows given ad libitum access to feed during lactation responded with productivity.

Key Words: Sow, Lactation, Feeder

796 Interactive effects of milk supplementation, parity and season on preweaning mortality and growth performance of piglets on a commercial farm. B. W. Ratliff1,2, A. M. Gaines2, L. G. Allee1, M. O’ Brien1, and J. A. Coeison2, 1University of Missouri, Columbia, 2Merrick’s, Inc., Union Center, WI.

A total of 703 (Geneporc) sows and 7,301 piglets (PIC 337 x Genetiporc) were used on a commercial farm to evaluate the interactive effects of milk supplementation, parity and season on piglet growth performance and pre-weaning mortality. Data were collected over a 12 month period. Sow diets were formulated to meet all minimal NRC requirements. Sows were grouped according to parity as follows: parity 1 = group 1, parities 2 and 3 = group 2, and all parities greater than 3 = group 3. Litters from sows within the same group were randomly allotted to either milk or no milk treatments. At 48 h post parturition, milk supplementation was initiated and piglets were counted and weighed. All cross-fostering and litter processing occurred prior to 48 h. Mortalities, their weights, and date of occurrence were recorded daily for each litter. At d 14 to 18, each litter was weighed, counted, and weaned. Data indicated that milk supplementation increased (P < 0.05) number of pigs weaned, weaning weight and total litter gain (includes mortality weights), while lowering (P < 0.05) pre-weaning mortality. Parity groups 1 and 2 weaned more (P < 0.05) pigs per sow and had lower (P < 0.05) body condition scores and pre-weaning mortality than parity group 3. Furthermore, parity groups 1 and 3 had lighter (P < 0.05) weaning weights, piglet average daily gains and total litter gains than parity group 2. Warm season decreased (P < 0.03) piglet average daily gain. Treatment by parity group interactions (P < 0.05) were present for number of pigs weaned, litter weaning weight, pre-weaning mortality and total litter gain, with milk supplementation being most beneficial for parity groups 2 and 3 sows. Milk supplementation did not affect (P > 0.05) any parameters measured in parity group 1 sows. Collectively, these data indicate that milk supplementation will improve litter growth performance and decrease pre-weaning mortality in parity 2+ sows.

Key Words: Milk Supplement, Piglets, Sows

Production, Management and the Environment: Nutritional Management

797 Blood metabolites during the transition period of Holstein cows receiving a monensin controlled-release capsule. P. Melendez1, J. Goff1, C. Risco1, L. Archbald1, R. Littell2, and A. Donovan3, 1College of Veterinary Medicine, University of Florida, Gainesville, 2Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 3National Animal Research Center, USDA, Ames, IA.

Monensin increases the rumen molar proportion of propionate. This change might affect energy metabolic dynamics in transition dairy cows. The objective of this study was to determine the effect of a rumen monensin-controlled release capsule inserted at dry-off on energy blood metabolites in Florida transition cows fed diets containing citrus pulp. The study was conducted on a Holstein farm with 3600 milking cows in north central Florida, with a RHA of 10,700 kg. Cows were housed in a dry-lot system and fed the same TMR 3X. In March, 2002, 24 cows were randomly assigned at dry-off to 2 groups. Treated cows (n=12) received an oral capsule of monensin (900 mg/d for 95 d, CRC Rumensin). Control cows (n=12) were not treated and matched by parity. At 10 d pp a rumen and blood sample was obtained at 7 A.M. before the first meal. Other samples were taken at 2, 4 and 6 h after feeding (AF). Rumen pH was measured immediately after sampling. Serum non-esterified fatty acids (NEFA), beta-hydroxy butyrate (BHB) and glucose were measured by enzymatic colorimetric methods. Rumen samples were analyzed for concentration of VFA, lactic acid and NH3. Variables were analyzed by ANOVA, mixed models for repeated measures. Primiparous controls tended to have lower rumen pH at 4 AF than treated cows (6.34 vs 6.62) (P ≤ 0.1). Primiparous treated cows had significantly lower rumen pH at 4 AF (5.44 vs 5.01 mmol/L) (P ≤ 0.05) than controls. In treated primiparous, BHB tended to be lower at 2 AF (0.65 vs 1.0 mmol/L) and 4 AF (0.57 vs 1.0 mmol/L) (P ≤ 0.05) than controls. In treated primiparous, BHB tended to be lower at 2 AF (0.65 vs 1.0 mmol/L) and 6 AF (0.71 vs 0.99 mmol/L) (P ≤ 0.1) and was lower at 4 AF (0.57 vs 1.0 mmol/L) (P ≤ 0.05) than controls. NEFA tended to be lower at time 0 (0.82 vs 1.14 meq/L) (P≤0.1) and glucose tended to be higher at 2 h AF (54.4 vs 45.9 mg/dL) (P ≤ 0.1) and had significantly lower NH3 at 6 AF (2.8 vs 4.01 mmol/L) (P ≤ 0.05) than controls. In treated primiparous, BHB tended to be lower at 2 h AF (0.77 vs 1.05 mmol/L) (P ≤ 0.1) and was lower at 4 h AF (0.57 vs 1.0 mmol/L) (P ≤ 0.05) than controls. NEFA tended to be lower at time 0 (0.82 vs 1.14 meq/L) (P≤0.1) and glucose tended to be higher at 2 h AF (54.4 vs 45.9 mg/dL) (P ≤ 0.1) in treated than controls. In treated primiparous cows, BHB tended to be lower at 4 AF (0.77 vs 1.05 mmol/L) (P ≤ 0.1) and was lower at 6 h AF (0.82 vs 1.18 mmol/L) (P ≤ 0.05) than controls. NEFA were lower at 2 h AF in treated than controls (0.59 vs 0.92 meq/L) (P ≤ 0.05). Glucose tended to be higher at 2 h AF in treated than controls (51.2 vs 46.3 mg/dL) (P ≤ 0.1). It was concluded that transition cows under monensin had improved energy status within 6 h AF.

Key Words: Monensin, VFA, Transition Dairy Cow

798 Rumen and blood metabolites at 10 d post-partum in Holstein cows supplemented with monensin. P. Melendez1, J. Goff2, C. Risco1, L. Archbald1, R. Littell3, and A. Donovan1, 1College of Veterinary Medicine, University of Florida, Gainesville, 2National Animal Research Center, USDA, Ames, IA, 3Institute of Food and Agricultural Sciences, Gainesville, FL.

The objective was to assess the effect of a monensin controlled-release capsule inserted at dry-off on rumen and energy blood metabolites at 10 d postpartum (pp) in transition cows fed Florida typical diets. The study was conducted on a Holstein dairy with a RHA of 10,700 kg. Milk supplementation did not affect (P > 0.05) number of pigs weaned, weaning weight and total litter gain (includes mortality). Parity groups 1 and 2 had higher (P < 0.05) pre-weaning piglet mortality than parity group 3. Furthermore, parity groups 1 and 3 had lighter (P < 0.05) weaning weights, piglet average daily gains and total litter gains than parity group 2. Warm season decreased (P < 0.03) piglet average daily gain. Treatment by parity group interactions (P < 0.05) were present for number of pigs weaned, litter weaning weight, pre-weaning mortality and total litter gain, with milk supplementation being most beneficial for parity groups 2 and 3 sows. Milk supplementation did not affect (P > 0.05) any parameters measured in parity group 1 sows. Collectively, these data indicate that milk supplementation will improve litter growth performance and decrease pre-weaning mortality in parity 2+ sows.

Key Words: Milk Supplement, Piglets, Sows

799 Warm-season baleage crops for mid-lactation Holstein cows. M. E. McCormick, Southwest Research Station, Louisiana State University, Franklinton.

Conserving forage as baleage is becoming widely accepted by Louisiana dairymen. In the present study, production-scale pastures of bermudagrass (Cynodon dactylon, L.), signalgrass (Brachiaria decumbens, S.)