and predicted dry matter (DM) digestibility was not influenced by level of feeding, with observed digestibility averaging 66.9 % (SEM=1.84). Predicted digestibility values, estimated without correction for alkane recovery were 86, 96, 93 and 100 % of observed, using C_{27}, C_{29}, C_{31}, and C_{33} alkanes, respectively, with C_{27} and C_{31} being different ($P<0.05$) to the observed value. When adjustments were made for alkane recovery, corresponding values were 118, 104, 108, and 100 %, with only the C_{27} value being different ($P<0.05$) from the observed value. Predicted DM intake using the C_{31}:C_{32} ratio was underestimated at the restricted ($P<0.05$) and ad libitum ($P<0.10$) levels of feeding, when calculated using the manufacturers release rate (190 mg d^{-1}). However, when actual release rates of 239 (restricted) and 211 (ad libitum) mg d^{-1} were used, estimates agreed with observed values. Although the accuracy of prediction for DM intake was high, the precision was low, with significant ($P<0.05$) discrepancies for both treatments and all methods of measurement. Discrepancies of up to 2.9 kg d^{-1}, when average DM intake was only 7 kg d^{-1} was a concern. Endogenous alkanes can be used to accurately predict digestibility. However daily fecal grab samples did not give precise measurements of intake, based on the ratio of endogenous to exogenous alkane markers.

Key Words: Alkane, Marker, Forage

Nonruminant Nutrition
Ractopamine and Somatotropin on Nutrient Metabolism and Pork Quality

382 Effect of ractopamine on optimum dietary phosphorus regimen for growth in pigs.

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Ten replications of individually-penned gilts from a high-lean strain were utilized to determine the effect of ractopamine (RAC) on the optimum dietary available phosphorus (AP) regimen. At 70 kg BW, pigs were randomly allotted to a corn-soybean meal basal diet (.08% AP) adequate in all nutrients except AP. The basal diet was supplemented with mono-dicalcium phosphate to create six AP concentrations (.08, .13, .18, .23, .28, .33%) and ractopamine HCL to create two RAC concentrations (0 vs. 20 ppm). A constant Ca/AP ratio of 2.5:1 was maintained in each diet. BW gain and feed intake were recorded weekly until each pig individually reached 114 kg BW. Pigs were then slaughtered keeping the ham and loin for subsequent dissection and bone removal. Dietary AP additions resulted in improved ($P<.01$) daily BW gain, but did not alter carcass or ham-loin muscle content. Dietary AP additions also linearly improved ($P<.01$) bone integrity as observed by ham-loin bone content and femur weight and mineral content. RAC improved ($P<.01$) BW gain (+125 g), gain/feed ratio (+64 g/kg), and carcass and ham-loin muscle (+3.4%, +5.6%) content. RAC reduced ($P<.01$) the ham-loin bone content and femur weight and mineral content, but the amount of additional bone or bone mineral accrued per unit of added dietary AP was linear and independent of RAC. Based on breakpoint analysis, BW gain and femur mineral content in non-RAC pigs were optimized at dietary AP concentrations of .20% and .31%, respectively. Because of their greater muscle accretion capacity, thus P demand, pigs fed RAC from 70 to 114 kg BW needed an additional .02 to .03% AP to maintain the same ham-loin bone and femur mineral contents as the non-RAC pig.

Key Words: Ractopamine, Phosphorus, Pig

383 Effects of vitamin and mineral concentrations and ractopamine hydrochloride in diets for growing-finishing pigs.

C. Starkey*, J. Hancock, D. Kropf, C. Jones, K. Hachmeister, T. Lawrence, D. King, and J. Dunn, *Kansas State University, Manhattan.*

A total of 160 pigs (two pigs/pen and 10 pens/treatment) were used to determine the effects of added vitamins and minerals (VM) and ractopamine hydrochloride (RAC) on growth and carcass characteristics. Treatments for 32 to 96 kg were corn-soy diets formulated to 70 and 130% of NRC recommendations for vitamins (A, D, E, K, niacin, pantothenic acid, riboflavin, thiamin, B_6, and B_{12}) and minerals (I, Fe, Se, and Zn). For 96 kg to 123 kg, treatments of with or without VM additions and without or with RAC (20 mg/kg) were imposed. No differences in ADG or gain/feed were observed from 32 to 96 kg among pigs fed diets with the 70 and 130% treatments ($P > 0.2$). For 96 to 123 kg, there were no differences in ADG or gain/feed among pigs fed the diets with or without VM ($P > 0.7$), but RAC increased ADG and gain/feed ($P < 0.001$). These effects were consistent regardless of prior vitamin and mineral fortification, i.e., no interactions ($P > 0.15$) with the 70 and 130% treatments from 32 to 96 kg BW. Carcass measurements were not affected by the 70 vs 130% or the with vs without VM treatments ($P > 0.06$). Pigs fed RAC had heavier ($P < 0.01$) carcasses, less ($P < 0.05$) last-rib backfat thickness, and greater ($P < 0.01$) dressing percentage, longissimus area, and percentage carcass lean. In conclusion, low inclusions of VM from 32 to 96 kg BW and withdrawal of VM from 96 kg to market had no effects on growth or carcass characteristics. Also, RAC did not increase the need for VM supplementation.

	ADG, kg	Gain/feed kg	HCW, backfat, mm	Item[a] 10th rib simus area, cm^2	Longis-lean, %	Carcass
70% +VM -RAC	1.01	0.377	88.8	20	35	51.6
+VM +RAC	1.01	0.380	92.9	17	38	53.5
-VM -RAC	1.03	0.377	89.9	19	34	52.1
-VM +RAC	1.05	0.383	92.7	17	38	53.5
130% +VM -RAC	0.98	0.369	88.3	18	36	52.8
+VC +RAC	1.05	0.393	93.8	17	38	53.4
-VM -RAC	1.03	0.382	89.9	19	36	52.4
-VM +RAC	1.07	0.385	93.1	16	39	54.1
SE	0.02	0.007	2.0	1	1	.05

[a]Overall data (32 to 123 kg).

Key Words: Pig, Vitamins and minerals, Ractopamine

384 Effects of vitamin and mineral concentrations and ractopamine hydrochloride on pork quality.

C. Starkey*, J. Hancock, D. Kropf, C. Jones, K. Hachmeister, T. Lawrence, D. King, and J. Dunn, *Kansas State University, Manhattan.*

A total of 160 pigs (two pigs/pen and 10 pens/treatment) were used to determine the effects of added vitamins and minerals (VM) and ractopamine hydrochloride (RAC) on pork quality. Treatments for 32 to 96 kg BW were corn-soy diets formulated to 70 and 130% of NRC recommendations for vitamins (A, D, E, K, niacin, pantothenic acid, riboflavin, thiamin, B6, and B12) and minerals (I, Fe, Se, and Zn). For 96 kg to 123 kg, treatments of with or without VM additions and without or with RAC (20 mg/kg) were imposed. No differences ($P > 0.05$) among pigs fed the VM and RAC treatments were observed for initial color score, expressible moisture, water-soluble protein, and pH of the longissimus 24 h after slaughter. However, RAC increased shear force ($P < 0.001$) and deletion of VM from 96 to 123 kg increased thiobarbituric acid values (TBA) slightly at d 6 ($P < 0.01$). An interaction among the VM and RAC treatments indicated that marbling increased when RAC was added to diets with VM and decreased when RAC was added to diets without VM ($P < 0.04$). Also, thaw loss and cooking loss decreased when RAC was added to diets with VM and increased when RAC was added to diets without VM ($P < 0.05$). In conclusion, the VM treatments had few affects on measurements of pork quality, but RAC did increase shear force. Also, there were VM by RAC interactions that suggested slight decreases in pork quality when RAC is used in diets without VM from 96 kg to slaughter.

Item	Ultimate pH	Expressible moisture, mg/g	Color score[a]	Marbling score	TBA at d 6[b], mg/1000g
70% +VM -RAC	5.83	122	4.1	3.1	0.11
+VM +RAC	5.82	120	3.8	3.5	0.09
-VM -RAC	5.88	123	4.0	3.2	0.11
-VM +RAC	5.80	132	4.0	3.2	0.15
130% +VM -RAC	5.76	133	4.1	3.2	0.11
+VC +RAC	5.94	100	4.1	3.5	0.08
-VM -RAC	5.72	172	3.9	3.2	0.13
-VM +RAC	5.78	151	3.7	2.8	0.12
SE	0.06	23	0.1	0.2	0.02

[a]NPPC color (scale of 0 to 6) and marbling (scale of 0 to 10).
[b]TBA at d 6.

Key Words: Pork quality, Vitamins and minerals, Ractopamine

385 Effect of space allocation and ractopamine (Paylean®) on barrow growth performance and carcass characteristics. M C Brumm*[1], R C Thaler[2], and P S Miller[1], [1]*University of Nebraska,* [2]*South Dakota State University.*

Danbred USA barrows (n=264, 29.7 kg BW) were used to evaluate the effects of space allocation and ractopamine (Paylean®) (P) addition to finishing diets. Space allocations of .55 m^2 (CR) and .74 m^2 (UC) from arrival to slaughter were achieved by housing 19 or 14 pigs per fully slatted pen. Four weeks prior to slaughter, P treatments of 0 or 10 ppm in corn-soybean meal based diets formulated to contain 0.92% lysine and 16.1% CP were initiated within space allocation treatments. There were four pens per treatment combination. Diets contained 1.10% lysine from arrival to 36 kg BW, 0.97% from 36 to 69 kg and 0.77% from 59 kg to 4 weeks prior to slaughter. All UC pigs were slaughtered on d 86 (107.1 kg BW), with CR pigs slaughtered on d 93 (108.6 kg BW). There was no effect of 10 ppm P on ADG, but ADF decreased (2.70 vs 2.89 kg/d; P<0.01) and gain:feed improved (0.351 vs 0.322; P<0.01) vs the 0 ppm treatment during the 4 wk of P treatments. Overall, ADG (0.86 vs 0.91 kg; P<0.01) and ADF (2.32 vs 2.41 kg; P<0.1) were reduced for the CR vs UC treatments. While there was no effect of P on overall ADG or ADF, there was improvement in gain:feed (0.379 vs 0.368; P<0.10) for the 10 vs 0 ppm treatment. On d 86, all pigs were individually scored for severity of tail biting on a 1 to 4 scale with 1 being no evidence of tail biting and 4 severe tail biting. Space allocation (1.4 vs 1.3 mean score, CR vs UC respectively) and P treatment (1.5 vs 1.3, 10 vs 0 ppm respectively) had no effect (P>0.10) on tail biting. Although there was no effect of P on slaughter weight (107.8 kg BW), carcass yield increased slightly (75.3% vs 74.6%; P<0.10) for the 10 vs 0 ppm treatment. Carcass backfat measured by IPB, Inc personnel decreased for the CR vs UC treatments (15.0 vs 15.7 mm; P<.10). There was no effect of space allocation on loin muscle depth, estimated carcass % lean or IBP carcass merit. Barrows fed 10 ppm P had greater muscle depth (68.8 vs 67.0 mm; P<0.01), carcass lean (56.0 vs 55.5%; P<0.01) and carcass merit ($0.132 vs $0.122/kg; P<0.05) than the 0 ppm fed pigs. These results suggest that the response to P is independent of the response to altered space allocation.

Key Words: Pigs, Ractopamine, Space

386 Excessive amino acids limit the response to exogenous porcine Somatotropin (pST). D. Brana-Varela and J. A. Cuaron*, *CNI-Fisiologia y Mejoramiento Animal, INIFAP, Mexico.*

Two experiments were conducted to revise the effect of graded levels of pST (daily i.m. injections/28-d) and of dietary Lys. Relative to Lys, Thr, Met and Trp were constant and CP was ∼15.4×Lys. Exp. 1, a factorial arrangement of 3 pST doses (0, 3 and 6 mg/pig/d) and 3 Lys (g/kg, true ileal digestible) to energy (ME, Mcal/kg) ratios (LTE): 1.87 (6/3.2), 2.31 (7.5/3.25) and 2.76 (9.1/3.3), had 18 pens of 16 pigs (1:1 gilts and barrows) in a commercial farm affected by respiratory diseases. Pigs were weighed initially (99.9±2.3 kg) and every two weeks; Feed intake was recorded once every week; Fat and muscle depths at P2 were measured on the 10th and last ribs in the same interval by real time ultrasound scanning. Exp. 2 was the factorial arrangement of 3 pST levels (0, 2.5 and 5 mg/pig/d) and 3 dietary Lys densities (.7, .81 and .92%) at a fixed dietary energy level (ME, 3.2 Mcal/kg); Sex (barrows and gilts) was included as a factor. Pigs (72) were individually housed to 4 replications in the 3×3×2 interaction. Initial wt was 83.3±6 kg; Feed intake was measured daily; Body wt change was recorded weekly and lean eye area, fat and muscle depths were registered initially and on d-14 and 28. In Exp. 1, pST resulted in a linear (P<.004) reduction of feed intake (2.9, 2.6 and 2.4 kg/d), as identically did the LTE ratios. In the interaction, avg. daily feed intake (ADI) is depicted by the equation ADI=3.497-(.088×pST dose, mg/d)-(.11×LTE^2); P<.001, r=.91. While pST improved quadratically (P<.05) avg. of daily gain (ADG: 728, 805 and 793 g/d), LTE resulted in similar ADG (786, 771 and 770 g/d). Daily pST reduced linearly (P<.001) backfat change (4.2, 1.4 and -1.2 mm) but, in muscle depth change, pST and LTE interacted (P<.001). The response to Lys and pST in Exp. 2, was a linear decrease (P<.01) in ADI, but ADG resulted in a Lys×pST interaction (P<.06): at 0 (742, 716 and 765 g/pig) or 2.5 mg/pig/d (1003, 811 and 797 g/d), Lys resulted in none or a negative change, while the slope was positive (855, 960 915) with the 5 mg/d dose. Body composition was affected by pST, a linear reduction (P<.001) in backfat, or increments (P<.03) in muscle depth. If Lys concentration in the diet exceeds the requirement, the effects on ADI and ADG will be negative.

Key Words: Amino acids requirements, Somatotropin, Finishing pigs

Physiology
Estrus Synchronization I

387 Paired use of milk progesterone testing and a PreSynch OvSynch timed insemination protocol in lactating dairy cows. J.D. Ferguson[1], D.T. Galligan[1], J.W. Brooks*[2], G. Azzaro[2], S. Ventura[2], and G. Licitra[3], [1]*University of Pennsylvania,* [2]*Consorzio Ricerca Filiera Lattiero-Casearia, Ragusa, Italy,* [3]*University of Catania, Italy.*

The objective was to improve herd reproductive efficiency by using milk serum progesterone (P4) testing with a modified PreSynch OvSynch program. Nine test herds ranged in size from 30 to 140 lactating dairy cows. Milk samples were collected at 14 day intervals beginning at 3 weeks post partum. A threshold P4 concentration was calculated to classify samples as "high" or "low". Sampling continued for each cow until at least one "high" value was obtained, indicating cyclicity. Percentages of cows which began cycling at 5, 7, 9, and more than 9 wks were 72.9%, 15.7%, 8.3%, and 3.1% respectively of 420 cows. Thus, 27.1% of cows bred before 7 wks post calving are acyclic, meriting use of a milk P4 test to identify acyclic cows. At each of the first two samplings cows received 25 mg PGF2α (Dinolytic®, Pharmacia & Upjohn) for PreSynch. Cyclic animals continued with OvSynch beginning 14 days after the most recent sampling. Cows were administered 50 mg GnRH (Cystoreline®, VETEM) (d -10), followed by 25 mg PGF2α (d -3), then 50 μg GnRH (d -1) with AI to follow 8-18 hrs later (d 0). For possible reinsemination, all cows not returning to estrus were administered 50 mg GnRH 32 days after insemination (d 32), with rectal palpation for pregnancy to follow in 7 days (d 39). Thus, all normally cycling cows were inseminated at 59-65 d post calving and at 101-107 d post calving if non-pregnant at palpation. Reproductive data were also collected from 9 control herds (n=463) matched for cow number with test herds (n=482). First service CR for all animals was greater (P<0.05) in test herds than control herds (34% vs. 23%). Days to first breeding was lower for test cows than for control cows (66 vs. 73; SE=0.681 and SE=1.92). Upon completion of data collection, reproductive efficiency will be analyzed by survival anal-