172 Effect of dietary betaine additions and amino:calorie ratio on performance and carcass traits of finishing pigs. K.D. Haydon*, R.G. Campbell and T.J. Prince. Carl S. Akey, Inc., Lewisburg, OH and Bunge Meat Industries, Ltd. Corowa, NSW, Australia.

Three trials were conducted to investigate the effect of feeding betaine (1 g/kg of diet) to finishing male, female and/or castrate pigs. Trial 1 examined the effect of feeding 4 available lysine to calorie ratios (LC;.36, .42, .49 or .56 g/MJ DE) with or without betaine to 40 males and females (71 kg initially) for 41 d in a 2 x 4 factorial treatment arrangement. Males consumed more (P<.01) feed and gained faster (P<.01) than females. The addition of betaine (BT) to the diet of gilts tended to lower feed intake as compared to controls with no effect in males resulting in a BT x sex interaction (P<.05). A LC x BT interaction (P<.05) was observed for feed:gain ratio (FG) with gilt fed BT having a lower FG than controls with no consistent response in males. Trial 2 utilized a similar 2 x 4 factorial treatment arrangement but LC offered were .45, .50, .62 or .67 g/MJ DE using 160 gilts (103 kg initially) fed for an average of 26 d with or without BT. Daily gain and feed intake were improved by 22 and 14% with addition of BT in the .45 LC diet, but BT tended to depress intake and growth at higher dietary LC levels (.62 or .67 g/MJ DE). P2 and tenth rib fat depths were greater (P<.05) and LEA lower (P<.07) for BT-fed as opposed to control-fed gilts. Trial 3 was designed as a 2 x 2 x 4 factorial with two dietary DE levels (14.7 or 13.8 MJ/kg) fed at 4 LC (.39, .43, .47 or .51 g/MJ DE) with or without BT using 160 castrates (101 kg initially) for 26 days. A BT x DE interaction (P<.10) was observed for ADG and feed intake. Pigs fed diets with 13.8 MJ/kg with BT tended to consume less fed and grow slower than without BT. In contrast, BT additions to diets with 14.7 MJ diets tended to increase feed intake and gain. As observed in trial 2, feed intake and ADG tended to improve with BT addition to lower LC diets. Increasing LC linearly (P<.05) decreased P2, first rib and last lumbar fat depths. LC x BT interaction (P<.10) was observed for first rib fat depth and LEA. Data indicates BT response on growth and/or carcass is influenced by dietary LC and DE level. BT tends to improve growth performance in lower LC (protein) diets, but depress intake and gain in high LC (protein) diets.

Key Words: Pigs, betaine, lysine:calorie ratio, growth, carcass.

173 **The effects of supplementing growing-finishing swine diets with betaine and (or) choline on growth and carcass characteristics.** J. W. Smith, II*, J. L. Nelssen, R. D. Goodband, M. D. Tokach, B. T. Richert, K. Q. Owen, J. R. Bergstrom, and S. A. Blum[1]. Kansas State University, Manhattan, and [1]Lonza, Inc., Fairlawn, NJ.

Eighty crossbred gilts (initially 60.7 kg) were used in a growth assay to evaluate the effects of supplementing finishing diets with betaine and (or) choline on growth performance and carcass characteristics. Betaine at 0 or 1,000 ppm and supplemental choline at 0 or 100 ppm were used in a 2 x 2 factorial arrangement with eight randomized complete blocks. A fifth treatment, 1,000 ppm betaine from a liquid, 16 carbon betaine (Lonzaine - 16, distributed by Lonza, Inc., Fair Lawn, NJ), was added to further evaluate the efficacy of another form of betaine. Pigs were blocked by weight and ancestry and allotted to one of the five dietary treatments. The corn-soybean meal based experimental diet was formulated to .75% lysine, .65% Ca, and .55% P. Pigs fed the diet supplemented with betaine had higher ADG (P < .08) than pigs fed the control diet. The pigs fed the diet with added choline had decreased G/F (P < .04) and ADG (P < .08) than pigs fed the other diets. When pigs were slaughtered at 104 kg, pigs fed the diet with added betaine tended to have larger loin muscle areas (LMA, P < .07) than pigs fed the control diet. No differences were found for average backfat thickness, tenth rib backfat depth, or percentage muscle between pigs fed the various diets. A single degree of freedom contrast revealed no difference between the pigs fed the control diet and the diet containing long-chain betaine. An on-farm evaluation used 262 pigs to further evaluate the use of betaine in a commercial scenario. Pigs were fed either a diet without betaine or one with 1,000 ppm betaine. This trial revealed no differences between pigs fed the two diets for backfat depth or percentage lean, however, pigs fed betaine had greater loin depth (P < .07). The results of these trial indicate 1) no benefit to inclusion of choline in the grow-finish diet; and 2) further research into the mechanisms of betaine is needed due to the different responses elicited in various research trials. In conclusion, the use of betaine must be evaluated on a farm-to-farm basis to determine the economic benefits in finishing pig diets.

Trial 2	Control	Betaine	CV
No. pigs	90	172	
Loin depth, mm*	55.12	57.48	12.4
Backfat, mm	17.31	17.21	25.2
Lean, %	54.74	54.41	9.7

*Betaine effect (P < .07)

Trial 1		Control	Betaine	Choline	Bet + Chol	Bet - C16	CV
61 - 104 kg	ADG, kg[ab]	.79	.83	.78	.79	.80	5.6
	G/F[c]	.34	.35	.32	.33	.34	7.8
Carcass	Avg. BF, cm	3.15	3.12	3.20	3.02	3.18	10.3
	LMA, cm²[a]	28.13	30.97	28.32	29.03	30.65	13.4
	Muscle, %[d]	51.05	51.10	50.88	51.69	51.75	4.1

[a]Betaine effect (P < .08) [bc]Choline effect (P < .08, and 04, respectively)
[d]Muscle percent was derived from NPPC equations for carcasses with 10% fat.

Keywords: Betaine, Choline, Pigs, Grow-finish

174 **Effect of starter feeding on growth performance and lean body mass at market weight in two different swine genotypes. K. Y. Whang* and R. A. Easter, University of Illinois, Urbana.**

A trial was conducted to access the effect of dietary treatment during the starter period on growth performance and lean yield at market weight in barrows and gilts from Yorkshire-Duroc females mated to Hampshire sires (F2) and Camborough 15 females mated to PIC line 405 sires (PIC). Pigs (age = 21 ± 3 d; weight = 4.93 ± .09 kg) were used in a 2 x 2 x 2 factorial arrangement of eight treatments. Animals were randomly assigned to treatments from blocks based on litter of origin, weight and gender. Treated animals were divided according to gender and genotype. A high- (H) or low- (L) quality feeding program was provided for 41 d postweaning. The H was a three-phase program while L was a single-phase program. The phase 1, 2 and 3 diets of H were provided from d 0 to 7, d 7 to 21 and d 21 to 41, respectively. While diets were isonitrogenous and isocaloric, qualitative differences were due to ingredients used. After the starter period, pigs from H and L treatments were provided the same corn-soybean meal-based diets for the growing (d 41 to 85 postweaning) and finishing (d 85 to 151 postweaning) periods. A total of 80 pigs were slaughtered, carcass measurements were taken and lean body mass (LBM) at termination estimated (NPPC, 1991). Average daily gain of H was greater (P < .01) than that of L for the starter period in both genders and both genotypes. During finishing period, F2 barrows and gilts fed the low-quality diet sequence (FLB and FLS) tended to grow faster (P < .09) than F2 barrows and gilts fed the high-quality diet sequence (FHB and FHS). The terminal body weights of FHB and FLB were 111.16 ± 2.5 kg and 110.19 ± 2.6 kg, and those of FHS and FLS were 108.01 ± 2.2 kg and 107.02 ± 2.6 kg, respectively. However, PIC HB (PHB) tended to grow faster (P < .20) than PLB for whole experimental period. Final weights were 119.69 ± .02 kg for PHB and 112.77 ± 4.8 kg for PLB. Also, PHS and PLS had similar ADG for finisher period. The terminal body weights were 105.05 ± 4.0 kg for PHS and 100.41 ± 1.9 kg for PLS. Starter feeding program did not affect LBM at termination within gender or genotype. Gilts were leaner (P < .001) than barrows, but total LBM was not different. The PIC pigs (50.80%) were leaner (P < .05) than the F2 (49.07%) and had greater (P < .01) LBM (49.07 kg for PIC and 38.72 kg for F2). This experiment suggests that ability to compensate for retarded growth during the starter period depends on genotype, however lean growth is not affected by starter feeding program regardless of gender or genotype.

Key Words: Pigs, Starter feeding program, Lean gain

175 **Influence of diet complexity and weaning age (9 or 19 d of age) on growth and carcass composition from weaning to 109 kg.** S. S. Dritz,* T. Signer, M. D. Tokach, R. D. Goodband, J. L. Nelssen, K. Q. Owen, R. M. Musser, J. W. Smith, and B. T. Richert. Kansas State University, Manhattan.

A total of 180 high health status barrows (initially 3.4 or 5.4 ± .3 kg and 9 or 19 ± 1 d of age) was used in a growth assay arranged in a 2 x 3 factorial (6 reps per treatment). The objective was to determine the influence of two weaning ages and three diet complexity sequences on growth and carcass composition. Pigs were weaned and moved to a segregated, off-site nursery. The three complexity sequences varied widely in diet composition and the length of time the complex diets were fed from weaning (W) to 18 kg. Pigs were fed common diets from 18 to 109 kg. The high complexity sequence was formulated to achieve maximal gain regardless of cost, the medium complexity sequence was formulated to closely match current KSU recommendations, and the low complexity diets were simple diets with minimal amounts of alternative ingredients fed for short periods of time. The lean growth performance of pigs used in this trial was excellent as noted by the range of average daily lean gain from 18 to 109 kg of .30 to .35 kg. Pigs on the high or medium sequence had higher (P<.01) ADG than pigs on the low sequence in the first phase postweaning (W to 7 kg). However, growth performance of pigs fed the simple sequence was similar to the medium or high sequences from 7 to 18 kg. These results indicate that diet complexity is critical in the first week postweaning, but can be rapidly decreased without reducing performance when feeding high health status pigs. Although there were no differences detected for carcass protein or lipid percentage, the pigs weaned at 9 d of age and fed the low complexity sequence had the lowest percent protein and the highest percent lipid at 109 kg. The data indicates that similar growth performance can be achieved from 18 to 109 kg for pigs weaned at 9 or 19 d of age even when fed diets from weaning to 18 kg ranging widely in complexity. Further research is needed to further define the effects of nursery diet complexity in pigs of different health status.

	Wean Age:	9 day			19 day			P Value			
Item	Diet:	High	Med	Low	High	Med	Low	Age	Diet	AxD	CV
Weight, kg											
W to 7	ADG, kg	.29	.27	.25	.36	.36	.31	.01	.01	.36	10.0
	ADFI, kg	.32	.29	.27	.31	.32	.30	--	--	.03	6.5
7 to 18	ADG, kg	.52	.52	.50	.54	.54	.54	.01	.46	.09	2.7
	ADFI, kg	.73	.75	.73	.70	.72	.73	.07	.11	.20	3.2
18 to 109	ADG, kg	.88	.91	.88	.89	.92	.87	.82	.01	.40	2.9
	ADFI, kg	2.54	2.56	2.50	2.52	2.67	2.56	--	--	.01	1.5
Carcass, %											
11 kg	Protein	16.4	17.0	16.7	17.2	17.0	17.6	.13	.43	.83	6.1
	Lipid	9.3	8.1	8.5	9.1	9.4	8.5	.42	.20	.59	13.9
109 kg	Protein	16.8	16.3	15.0	16.1	16.7	16.5	.36	.29	.16	8.2
	Lipid	26.2	25.0	31.2	26.8	27.6	26.9	.79	.15	.11	13.8
Lean Gain, kg/d											
18 to 109 kg		.32	.35	.30	.32	.33	.32	.94	.19	.32	10.5

Key words: Starter pig, diet complexity, composition