342 **The effects of increasing dietary methionine in the phase II starter pig diet.** K.Q. Owen, J.L. Nelssen*, M.D. Tokach, R.D. Goodband, L.J. Kats, K.G. Friesen, B.T. Richert, and R.E. Musser. Kansas State University, Manhattan.

A total of 216 pigs (initially 5.6 kg and 21 d of age) was used in a 28 d growth trial to determine the effect of increasing dietary methionine in diets fed from d 7 to 28 postweaning on starter pig performance. Pigs were allotted by sex, weight, and ancestry and placed in pens containing 6 pigs each (six pens/treatment). All pigs were fed a common phase I diet for the first 7 d postweaning. The phase I diet contained 20% dried whey, 10% spray-dried porcine plasma (SDPP), 3% lactose, and 1.75% spray-dried blood meal (SDBM) and was formulated to contain 1.6% lysine and .44% methionine. After phase I, pigs were assigned to one of six dietary methionine treatments. The control diet was corn-soybean meal based, included 10% dried whey and 3% SDBM, and was formulated to contain 1.3% lysine and .27% methionine. DL-methionine replaced corn starch in the control diet to obtain the experimental dietary methionine levels of .30, .33, .36, .39, or .42%. Each diet contained .46% cystine and .07% added choline. Pigs were bled on d 7, 14, 21, and 28 to determine plasma urea N (PUN). During phase I, ADG, ADFI, and feed efficiency (G/F) were 307 g, 305 g, and 1.01, respectively. From d 7 to 14 postweaning, increasing dietary methionine quadratically improved ADG (P<.01), ADFI (P<.05), and G/F (P<.05). From d 7 to 28 postweaning, increasing dietary methionine had no effect on ADG or ADFI, but G/F was quadratically (P<.05) improved. Plasma urea N was not affected by dietary treatment. In conclusion, .36% dietary methionine was required during d 7 to 14 postweaning to maximize growth performance when pigs were fed a diet containing 1.3% dietary lysine. The optimal dietary methionine level decreased to between .30 and .33% from d 14 to 28 postweaning.

		Dietary Methionine, %						
Item		.27	.30	.33	.36	.39	.42	CV
d 7-14[a]	ADG, g[b,c]	179	187	225	245	240	197	18.7
	G/F[b,d]	.45	.45	.52	.56	.55	.48	16.2
d 7-28[a]	ADG, g	399	421	432	439	418	421	9.6
	G/F[d]	.60	.63	.62	.64	.62	.61	5.1
d 14	PUN, mg/dL	5.86	5.78	4.94	5.17	5.36	5.23	21.7
d 28	PUN, mg/dL	8.25	6.46	7.01	6.98	7.78	6.95	25.9

[a]Pig weight on d 7 used as covariate analysis. [b]Linear effect of methionine (P<.10). [c,d]Quadratic effect of methionine (P<.01) and (P<.05).

Key Words: Methionine, Pigs, Growth performance.

343 **Effects of dietary phytase, calcium and vitamin D o plasma mineral concentration in weanling pigs.** X.G Lei*, P.K. Ku, E.R. Miller, and M.T. Yokoyama. Michigan Stat University, East Lansing.

Effects of various dietary concentrations of microbial phytas (A. niger), Ca, and vitamin D on plasma concentration of Mg, Cu and Zn of weanling pigs were determined. A 2 x 2 x 2 factori experiment was conducted with 64 crossbreeds (4-wk-old) blocke into heavy (8.91 ± .23 kg BW) and light (7.17 ± .12 kg B groups. A low-P (.3%), corn-soybean meal basal diet w supplemented with two levels of phytase (units/g), 7 (suboptimal) and 1200 (optimal); of Ca (%), .4 (low) and . (normal); and vitamin D (IU/kg), 660 (normal) and 6600 (high) Plasma concentrations of Mg, Cu, and Zn of individual pigs wer measured at d 0, 10, 20 and 30. There was a margin interaction (P < .14) between dietary phytase and Ca on plas Zn concentration. Phytase at optimal level, compared with th at suboptimal level, increased (P < .05) plasma Zn concentrati only at the low dietary Ca level. However, normal dietary reduced (P < .05) plasma Zn concentration only at the opti level of phytase. Highest plasma Zn concentration was in pi receiving optimal phytase with low Ca and vitamin D. There w no treatment effect on plasma concentration of Mg or Cu. Hea pigs had higher (P < .05) concentrations of all three elemen in plasma than light pigs. In conclusion, a reduced Ca level the corn-soybean meal diet may be required for optimal phyta effect upon improvement in plasma Zn concentration.

Key Words: Pigs, Phytase, Calcium, Vitamin D, Zinc, Plasma

344 **Effect of chromium as chromium tripicolinate on glucose tolerance, insulin sensitivity and plasma metabolites in pigs.** E.K. Amoikon*, L.L. Southern, J.M. Fernandez, L.F. Berrio, T.L. Ward, and B.M. Olcott[1]. Louisiana State University Agricultural Center and LSU School of Veterinary Medicine,[1] Baton Rouge.

An experiment was conducted to evaluate the effect of chromium (Cr) as Cr tripicolinate (CrPic) on glucose tolerance, insulin sensitivity, and plasma metabolites of growing pigs. Twenty-four pigs (12 per diet; initial BW was 18.8 kg) were allotted to a control diet or to a diet supplemented with 200 ppb Cr as CrPic. The diets were formulated to provided 120% of the lysine requirement (NRC, 1988) for 20 to 50 kilogram pigs. The pigs were penned in groups of four and allowed *ad libitum* access to each diet for 19 d, at which time 20 pigs (10 per diet) were randomly selected and penned individually in plastic metabolism cages. The pigs were fed twice daily in the metabolism cages an amount approximating *ad libitum* intake. Following an adjustment period of 11 d, 14 pigs (7 per diet) were randomly selected and fitted with chronic indwelling catheters in the anterior vena cava. The pigs were allowed to recover for 3 d. A glucose tolerance test (*IVGTT*; 500 mg glucose/kg BW) and an insulin challenge test (*IVICT*; 0.1 IU porcine insulin/kg BW) were conducted. The blood samples collected at -10 and 0 min before the *IVGTT* test were analyzed for plasma metabolites. Growth performance, and fasting (16 h) plasma glucose, cholesterol, and total protein were not affected (*P > .10*) by CrPic. Fasting urea N (*P < .09*) and non-esterified fatty acids (*P < .02*) were decreased by CrPic.

	k (%/min)	T½ (min)
Glucose tolerance (IVGTT)		
Control	4.71	15.82
CrPic	6.10	11.71
Insulin sensitivity (IVICT)		
Control	2.92	24.90
CrPic	4.10	17.11

During the *IVICT*, glucose disappearance (*k*, %/min) was increased 40% (*P < .02*) and glucose half-life (*T½*, min) was decreased 31% (*P < .03*) in pigs fed CrPic. During the *IVGTT*, glucose *k* (30% increase) and *T½* (26% decrease) responded similarly, but the effects were not significant (*P = .17*). The results of this study indicate that Cr as CrPic increases insulin sensitivity in growing pigs.

Key Words: Chromium, Pigs, Glucose, Insulin

345 **Specific vitamin and mineral additions to an amino ac fortified, low protein, grain sorghum-soybean meal diet growing pigs.** **M. Cervantes* and G. L. Cromwell, University de B California, Mexicali; and University of Kentucky, Lexington.**

Previous research at our station has shown that the performance of grow pigs is not maximized when they are fed a low protein (10.5% CP), gr sorghum-soybean meal (SBM) diet, even though the diet is fortified w sufficient levels of the limiting amino acids. This study was conducted determine whether deficiencies of certain minerals (K, Mg) or vitamins (bio choline, folic acid), which are more abundant in SBM than in grain sorghu and which ordinarily are not added to pig diets, were responsible for limit maximum rate and efficiency of gain. Two 28-d experiments, each involv six replicates of two pigs/pen (19.2 to 35.5 kg) were conducted. The b diet consisted of 91% grain sorghum (yellow endosperm, 8.9% CP, .21% .33% thr, .35% ile, .38% met+cys), 5% dehulled SBM, .45% lys, .15% minerals, vitamins, and an antibiotic. Treatments in Exp. 1 were (1) ba (2) as 1 + ile (.08%) + met (.10%), (3) as 2 + K (.27%), Mg (.03%), bi (2 mg/kg), choline (330 mg/kg), and folic acid, (125 μg/kg), and (4) posi control (grain sorghum + SBM, 16.5% CP). Amino acids were adde meet at least 110% of the NRC requirement for the 20 to 50 kg pig. G feed/gain, and plasma urea N were: 562, 506, 589, 676 g/d; 2.71, 2.63, 2. 2.33; 7.8, 6.1, 6.8, 18.6 mg/dL, respectively. Growth rate was redu (P<.10) by ile+met addition, but was restored by K, Mg, and the thre vitamins. Feed/gain tended (P<.10) to improve with the addition of K, and the three B-vitamins. Pigs fed the positive control diet gained fa (P<.01) than those fed the amino acid, mineral, and vitamin suppleme diets. Treatments in Exp. 2 were (1) basal, (2) as 1 + biotin, choline, folic acid, (3), as 2 + K + Mg, and (4) positive control. Gain and feed/ were: 555, 561, 528, 660 g/d; 2.62, 2.64, 2.58, 2.37. No improvement pig performance resulted from the addition of the minerals or B-vitamins, pigs fed the positive control performed better (P<.05) than the other treatm groups. The overall results suggest that K, Mg, biotin, choline, and folic are adequate in a 10.5% CP, grain sorghum-SBM diet and are not the fact that limit maximum growth in pigs fed a low-protein, amino acid fortified

Key Words: Pig, Amino Acids, Minerals, Vitamins.