173 Effects of dietary analyzed calcium to analyzed phosphorus ratio on growth performance, carcass characteristics, and bone mineralization in 26- to 127-kg pigs. Carine M. Vier[1], Steve S. Dritz[2], Mike D. Tokach[1], Márcio A.D. Gonçalves[2], Uislei A.D. Orlando[3], Jon R. Bergstrom[4], Jason C. Woodworth[1], Robert D. Goodband[1], Joel M. DeRouchey[1], *[1]Kansas State University, [2]Jefo, [3]Genus PIC, [4]DSM Nutritional Products North America*

Our objective was to determine the effects of feeding different analyzed calcium to phosphorus (Ca:P) ratios on performance of growing-finishing pigs from 26 to 127-kg. A total of 1,134 barrows and gilts (PIC 359×Camborough, initial BW 26.3 ± 0.71 kg) were used in a 110-d growth trial with 27 pigs per pen and 7 pens per treatment in a randomized complete block design. The 6 dietary treatments were formulated to contain 0:75:1, 1.00:1, 1.25:1, 1.50:1, 1.75:1, and 2.00:1 analyzed Ca:P ratio. All diets were corn-soybean meal-based and were formulated to contain adequate standardized total tract digestible P (approximately 122% of NRC 2012 estimates) for the weight range in all 4 dietary phases. Treatments were achieved by increasing calcium carbonate at the expense of corn while maintaining a constant level of monocalcium phosphate. Experimental data were analyzed using generalized linear and nonlinear mixed models with pen as the experimental unit. Increasing analyzed Ca:P ratio increased (quadratic, $P < 0.05$) ADG, ADFI, and final BW. Feed efficiency (G:F) was relatively similar across analyzed Ca:P ratios of 0.75:1 to 1.75:1 but worsened (quadratic, $P < 0.05$) at the highest ratio of 2.00:1. Hot carcass weight (HCW) and carcass ADG increased (quadratic, $P < 0.05$) while carcass yield decreased (quadratic, $P < 0.05$) with increasing analyzed Ca:P ratio. Bone mineralization increased (quadratic, $P < 0.05$) with increasing analyzed Ca:P ratio. For ADG, ADFI, G:F, and bone ash, the quadratic polynomial model demonstrated the best fit. The maximum responses in ADG, ADFI, G:F, HCW, and bone ash were estimated at 1.38:1, 1.49:1, 1.29:1, 1.25:1, and 1.93:1 analyzed Ca:P ratio, respectively. In conclusion, for growing-finishing pigs from 26 to 127-kg fed diets adequate in STTD P, the analyzed Ca:P ratio to maximize growth performance and HCW criteria ranged from 1.25:1 to 1.49:1. A higher analyzed Ca:P ratio, estimated at 1.93:1, was required to maximize bone mineralization.

Table 1. Effects of analyzed Ca:P ratio on performance of 26- to 127-kg pigs

	Analyzed Ca:P ratio						Probability, P =	
Item[1]	0.75:1	1.00:1	1.25:1	1.50:1	1.75:1	2.00:1	Linear	Quadratic
ADG, g	923	955	961	949	951	929	0.952	0.005
ADFI, g	2338	2408	2419	2396	2382	2383	0.483	0.028
G:F, g/kg	395	397	398	396	399	390	0.435	0.045
Final BW, kg	124.9	129.0	130.0	128.2	128.0	125.6	0.904	0.005
HCW, kg	93.0	95.9	96.2	94.6	94.4	92.7	0.298	0.003
Carcass ADG, g	689	708	712	699	703	685	0.001	0.001
Yield, %	74.5	74.4	74.0	73.8	73.8	73.8	<0.001	<0.001
Bone ash, %	61.2	61.5	62.4	62.2	62.4	62.5	<0.001	0.017

[1]SEM for ADG, ADFI, G:F, final BW, HCW, Carcass ADG, Yield, and Bone Ash were 10.39, 28.77, 38.78, 1.12, 1.17, 0.91, 0.06, and 0.188, respectively.

Key words: bone ash, calcium, finishing pigs, phosphorus

178 A systematic review and meta-analysis of Ca digestibility and utilisation in growing and finishing pigs. Maciej M. Misiura[1], Joao A.N. Filipe[1], Carrie L. Walk[2], Ilias Kyriazakis[1], *[1]Newcastle University, [2]AB Vista*

The development of dietary recommendations based on digestible Ca values is an essential step to optimize pig performance and feed conversion because the present guidelines, expressed on total dietary Ca, are inadequate, as they ignore endogenous losses and the digestion process. A systematic review and meta-analysis of digestibility trials were performed to quantify factors affecting Ca absorption and retention, and to estimate endogenous Ca losses. Forty studies, corresponding to 201 dietary treatments performed on 1,204 growing pigs, were selected. Data analysis was performed in R using weighted linear mixed effects regression. The results indicated that while Ca absorption and retention (g/kg of BW/day) increased with increasing Ca ($P < 0.001$), with non-phytate-P ($P < 0.001$) and with exogenous phytase intakes ($P < 0.001$), these responses decreased with increasing phytate-P intake ($P < 0.05$). Interactions were detected between exogenous phytase and Ca intake ($P < 0.001$), indicating reduced efficacy of this enzyme, and between phytate-P intake and exogenous phytase ($P < 0.05$), indicating reversing of the direct negative effect of phytate-P on Ca absorption and retention. Based on the recommended Ca and P intake for a 25 kg pig, an exogenous phytase supplementation of 1,000 FTU/day could potentially improve Ca digestibility by 20–25%. There were no effects of animal characteristics (e.g. 'genotype') on Ca absorption and retention. The large amount of variance explained in Ca absorption (90%) and retention (91%) supported our a priori choice of independent variables. Estimated endogenous Ca losses were 239 mg/kg of DM (95% CI 114, 364). When scaled by bodyweight, the endogenous Ca excretion on Ca-and-P-free diets was 20.5 mg/kg of BW/day (95% CI 5.46, 36.5). These