	Conventional		Crystal Spring		
	dry		wet-dry		
	Coarse	Fine	Coarse	Fine	SE
ADG, g	970	978	999	1,007	22
Gain/feed, g/kg	349	360	368	379	5
Water, L/pig/d	8.7	7.6	5.2	5.1	.2
Fat thickness, mm	23.4	24.0	23.5	23.8	.8
Ulcer score	.00	.09	.01	.02	.03
Keratinization score	.10	.76	.20	.36	.09

Key Words: Feeder Design, Particle Size, Pig

130 Weighing accuracy in feedmills. T. van Kempen*[1], B. Park[2], M. Hannon[3], and P. Matzat[3], [1]*North Carolina State University,* [2]*Park Consulting,* [3]*Roche Animal Health and Nutrition.*

The ability to mix a quality feed is often equated to the quality of the mixer; the ability to weigh ingredients correctly has received little attention. To assess how accurately feedmills weigh out their ingredients, 14 feedmills specializing in swine diets were surveyed which yielded 8432 data points (for 229 ingredients and 11 to 44 batch records per ingredient). Amounts actually weighed (according to scale readings) were compared to calls and relative differences were analyzed statistically. Feedmills overdosed ingredients by 1.516.3%: between mills overdosing ranged from -0.7 to 13.0%. Weighing errors within the range of -10 to 10% were distributed normally. Over the entire range, though, a tailing to the right was observed suggesting that large weighing errors tended to be overdosing errors. Within-ingredient weighing variation ranged from 0.58 to 11.1% between mills and averaged 5.2%. Weighing errors and within ingredient weighing variation were correlated with large weighing variation leading to overdosing. Weighing errors were not associated with hand-dosing of ingredients nor were micro-ingredients per definition weighed with more error. A portion of the weighing problems observed was attributed to discrepancies between the call size and the scale resolution. For example, weighing 11.3kg on a scale with a 2kg resolution leads to a minimum error of 6%. Such problems occurred for 8.7% of the calls and resulted in a minimum error ranging from 0.01 to 20%, averaging 1.95%. Poor choice of scales was the major source of errors in weighing, and the relationship: weighing variation = $10^{1.56-0.50*log(call/scaleresolution)}$ explained 40% of the variation observed (P<0.05). Based on this equation, a ratio of 20 (e.g., 100kg call weighed on a scale with a 5kg resolution) results in a weighing variation of 8%. Weighing this same call on a scale with a 0.1kg resolution reduces weighing variation to 1.1%. Weighing ingredients in the right scale would thus benefit feed quality but also reduce diet cost as it would reduce the overdosing of ingredients.

Key Words: Precision Nutrition, Feed Milling, Weighing Accuracy

131 Effect of particle size and enzyme supplementation on nutrient excretion of growing pigs. M.A. Oryschak*[1,2], P.H. Simmins[3], and R.T. Zijlstra[1], [1]*Prairie Swine Centre Inc.,* [2]*University of Saskatchewan, Saskatoon, Canada,* [3]*Finnfeeds International Ltd., Marlborough, UK.*

The output of nitrogen (N) and phosphorus (P) is a growing public concern in areas with intensive livestock operations. The effect of particle size (PS) and enzyme supplementation on N and P excretion was investigated in a 4 x 3 factorial arrangement, with three particle sizes (400, FPS; 700, MPS; and 850μm, CPS) and four enzyme treatments (control, CON; β-glucanase/xylanase (444 and 1385 U/kg diet), CHO; phytase (374 U/kg diet), PHY; and CHO+PHY). Diets (70% barley, 25% peas) were formulated to contain 3250 kcal DE/kg, 1.6 g digestible Lys/Mcal and 0.12% available P, and were fed in wet mash form at 3 x maintenance DE. Pigs (25.3 $\pm$ 1.4 kg) were used in three 21-d periods to obtain five observations for each dietary treatment. Treatments were assigned randomly, each treatment being fed at least once per period. Pigs were housed in individual metabolism pens. Feces and urine were collected quantitatively to calculate total N and P excretion and to partition excretion into fecal and urinary components. For DM and CP digestibility an interaction between PS and enzyme treatment was observed (P<.05). Reductions in fecal N excretion of 16.5% and 23.6% were observed for FPS over MPS and CPS, while CPS lowered urinary N excretion by 12.8% and 11.2% compared to FPS and MPS respectively (P<.05). Total N excretion was reduced by 6.8% with FPS compared to MPS (P<.05). Increases in DE of 2% and 2.7% were seen with FPS compared to CPS and MPS, respectively (P<.05). Excretion patterns of both N and P were unaffected by CHO (P>.10). Total N excretion was reduced by 5.5% with PHY compared to CON, while fecal and total P excretion were lowered by 35% and 22.4% with PHY and CHO+PHY respectively, compared to CON (P<.05). Results suggested that PS had a greater effect on N excretion, while PHY supplementation affected P excretion. Based on N excretion patterns and retention, DE was probably not limiting protein deposition.

Key Words: Particle size, Enzyme supplementation, Nutrient excretion

132 Respiratory disease challenge effects on N balance, IGF-I, organ weights, and carcass characteristics in growing pigs. J.A. Loughmiller*, S.S. Dritz, J.L. Nelssen, M.D. Tokach, R.D. Goodband, and B.W. Fenwick, *Kansas State University.*

Castrated pigs (30 1 kg; PIC) were allotted in a randomized incomplete block design to determine the effects of an acute respiratory challenge on N balance, IGF-I, organ weight, and carcass traits. Pigs (n=30) were challenged on d 0 with Actinobacillus pleuropneumonia (APP), unchallenged and fed ad libitum (AL; n=7), or unchallenged and pair-fed the feed intake of an APP pig (PF; n=10). Collection periods were d -4 to -1, 0 to 3, 4 to 7, 8 to 11, and 14 to 17. Plasma was collected on d -3, 1, 5, 9, and 15. Treatment and linear time effects (P<.01) were observed for DM digestibility with treatment and quadratic time effects (P<.05) for N digestibility. Increased DM and N digestibility for APP pigs versus AL pigs was observed from d 0 to 3 and d 14 to 17 (P<.05) and versus PF pigs from d 0 to 3 and d 4 to 7 (P<.05). A treatment by time interaction (P<.05) was observed for N retained and treatment and quadratic time effects (P<.01) were found for urinary N. Greater N retention was observed for AL pigs versus APP pigs (P<.01) from d 0 to 3 (33.9 v 21.6 g/d) and 4 to 7 (38.1 v 23.4 g/d) and PF pigs (P<.03) from d 0 to 3 (33.9 v 24.7 g/d), 4 to 7 (38.1 v 20.4 g/d), and 8 to 11 (36.8 v 27.1 g/d). Urinary N was lower (P<.04) for PF versus AL from d 4 to 7, 8 to 11, and 14 to 17 and versus APP from d 0 to 3 and 8 to 11. Urinary N did not differ for AL versus APP (P < .48). Plasma IGF-I (treatment and quadratic time effects; P<.03) was lowest on d 1 for APP (155 ng/mL) versus AL (274 ng/mL; P<.01) and PF (275 ng/mL; P<.01). The IGF-I levels for APP tended to remain lower (P<.10) than AL through d 9, with PF having intermediate levels. Carcass traits and organ weights were not affected, except stomach weight was greater for PF versus AL (P<.01) and APP (P<.02). Results indicate that an acute respiratory challenge decreases N retention, which partially recovers by d 17 after challenge. The decreased N retention is due to reduced feed intake and increased proteolysis to support the immune response.

Key Words: N balance, disease, IGF-I

133 The effects of dietary feather meal concentration and space allocation on growth performance and carcass characteristics of barrows. K.-W. Ssu*[1], M. C. Brumm[2], P. S. Miller[1], and R. L. Fischer[1], [1]*University of Nebraska-Lincoln,* [2]*Haskell Agriculture Lab, University of Nebraska.*

Two hundred ten barrows and 45 gilts (initial wt 36 kg) of high lean gain potential were divided into five weight blocks to determine the effects of feather meal (FM) and pen space allocation on growth performance and carcass characteristics of barrows. The experiment was a 2 (0 and 20 % FM, F0 and F20) $\times$ 2 (.75 [UC] and .56 [C] m^2/pig [9 and 12 pigs/pen, respectively], space allocation) factorial treatment design with one control gilt (CG) group. Gilts were fed diets without FM from the start of the experiment to slaughter with a space allocation of .75 m^2/pig. Barrows assigned to F20 treatment were switched to FM diets when average pen weight was 72 kg. All treatment diets were formulated to be isocaloric within each phase. Diets for F0 contained .71, .59 and .49 % true ileal digestible lysine, while CG and F20 diets contained .78, .68 and .57 % from 36 to 60, 60 to 86, and 86 to 110 kg, respectively. Pigs were slaughtered and TOBEC data were collected on the week average pen weight was greater than 107 kg. There was no interaction ($P >$ .1) between FM and space. Dietary FM addition decreased ADFI (F0 vs F20, 2.49 vs. 2.41 kg, $P <$ .05) of barrows and had no effect on all other criteria. Crowding decreased ADG (C vs UC, .72 vs .75 kg, $P <$ .05) and ADFI (C vs UC, 2.39 vs 2.51 kg, $P <$ .01) of barrows and