

# Nonruminant Nutrition: Management

**W194 Importance of evaluating piglet daily weight gain during the first week after weaning.** G. J. M. M. Lima\* and L. S. Lopes, *Embrapa, Brazil.*

Performance after weaning is crucial for pig growth. There are few reports describing ADG over the first wk after weaning. Some individuals show low gains while others lose weight (wt) during this period, providing highly variable results. To study wt gain during the first wk after weaning, an experiment was conducted to determine the effects of 4 combinations of lactose sources with or without growth promoter (GP): T1 = whey - GP; T2 = whey + GP; T3 = lactose + GP; T4 = whey permeate + GP. Ninety-six pigs ( $7.10 \pm 0.12$  kg) were weaned at 21 d of age and distributed to pens according to a random block design with 8 replicates of 3 animals. Diets met or exceeded 1998 NRC levels and pigs had free access to feed and water. Animals were weighed daily and had no clinical signs of diseases. Diarrhea frequencies were similar among diets (X2 test,  $P = 0.69$ ). Overall average pig wt ( $n = 96$ ) at d 22, 23, 24, 25, 26, 27 and 28 were 6.90, 6.88, 6.98, 7.17, 7.25, 7.33 and 7.50 kg, respectively, with coefficients of variation (CV) from 11.72 to 12.66%. However, overall average individual ADG for this period were, respectively, -0.205, -0.022, 0.102, 0.184, 0.084, 0.079 and 0.165 kg, with CV ranging from -818.31 to 281.17%. There were no differences in ADG among treatments by ANOVA for any d ( $P > 0.35$ ) or for the first wk period (0.055 kg/d, CV = 123.92%,  $P = 0.46$ ). A diet effect was detected when all individual ADG were combined through multivariate analysis ( $P = 0.15$  by Wilks' Lambda test and  $P = 0.002$  by Roy's test). Overall frequencies of negative, zero and positive ADG in the first wk period were 16.73, 3.00 and 80.27%, respectively, and there were differences among diets ( $P = 0.03$ , X2 test). It was detected that T1 (without GP) showed more animals with negative gain in the first wk compared with other treatments ( $P < 0.05$ , X2 test). It is important to study ADG during the first wk after weaning in these experiments. Multivariate analysis and frequency study of ADG provides useful information for a better understanding of this critical period for pigs.

**Key words:** Swine, multivariate analysis, X2 test

**W195 Acquisition of garlic conditioned preference enhances the flavor hedonic power of porcine digestive peptides (PDP) in post-weaned piglets.** J. Figueroa\*<sup>1</sup>, D. Solà-Oriol<sup>1</sup>, S. L. Vinokurovas<sup>1</sup>, E. Borda<sup>2</sup>, and J. F. Pérez<sup>1</sup>. <sup>1</sup>*Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain*, <sup>2</sup>*Bioibérica, Barcelona, Spain*.

Piglets are reluctant to eat unfamiliar ingredients after weaning, which implies that innately preferred ingredients are commonly used in the design of these diets. However, the preference for a novel feed or flavor may be acquired as a result of an association with an intrinsically positive consequence. The aim of the present study was to explore the ability to increase the attraction and hedonism of a protein source in piglets by using synergy between their innate attraction and a flavor conditioned preference. A total of 240 non-deprived weaning piglets were trained during 8 d (alternate sessions) with a 2% Porcine Digestible Peptides (PDP) + 2% Garlic flavor solution and water (Synergy group), and with a 2% Garlic flavor and a 2% PDP solution (Control Group) in odd and even days, respectively. Double choice test (DCHT) between PDP+Garlic v/s PDP in water were performed on d 16, 23 and 30 after weaning. The first contact (number of piglets/pan for the first 15 s; FC) and 30 min solution intake were measured. Data was analyzed by using the GLM procedure of SAS. Higher FC values

were observed for PDP+Garlic over PDP solution on d 16 and 23 (4.8 vs. 2.3 and 4.5 vs. 2.8;  $P < 0.05$ ) for the Synergy group. No differences were observed for the Control group. Synergy group showed also a higher intake of PDP+Garlic than PDP at d 30 (773mL vs. 503mL;  $P < 0.05$ ). No differences were observed in the intakes achieved for the Control group. The present results indicate that a garlic conditioned preference may enhance the attraction of PDP solutions, showing a synergy effect. This effect may be used to increase piglet acceptance and reduce neophobia for new feed ingredients.

**Key words:** protein, piglets, hedonic

**W196 Nutrient composition changes in pigs and associated liver from birth to 21 days of age.** Y. L. Ma\*<sup>1</sup>, M. D. Lindemann<sup>1</sup>, J. L. Pierce<sup>2</sup>, and G. L. Cromwell<sup>1</sup>, <sup>1</sup>*University of Kentucky, Lexington*, <sup>2</sup>*Alltech Inc., Nicholasville KY*.

The objective of this study was to characterize nutrient composition in pigs and associated liver from birth to d 21 of age with specific interest in N and P for use in future determinations of lactation needs of sows for N and P. A week before the expected farrowing day, crossbred gilts ( $n = 10$ ) were moved to farrowing crates and monitored. Two pigs were randomly selected and euthanized at d 0 (within 2 h after birth; nursing deprived), 7, 14, and 21 from each litter. Pigs (whole body without liver and gastrointestinal tract) and associated liver were analyzed for N, ether extract (EE), P, and total ash on a dry matter (DM) basis. With advancing age, BW increased linearly (1.59, 3.00, 4.63, 6.27 kg;  $P < 0.01$ ), DM increased (19.8, 27.0, 29.2, 30.0%;  $P < 0.05$  for linear [L], quadratic [Q], and cubic [C] responses), N decreased (9.77, 8.37, 8.24, 8.40%;  $P < 0.01$ ; Q), EE increased 6-fold from birth to d 7 (5.7, 34.3, 35.8, 37.1%;  $P < 0.01$ ; Q), P decreased (3.49, 2.27, 1.82, 1.78%;  $P < 0.01$ ; Q), total ash decreased, in particular during first 7 d (20.0, 11.9, 10.0, 10.0%;  $P < 0.01$ ; Q), and the unaccounted portion (carbohydrates) decreased, especially for the first 7 d (13.3, 1.5, 2.6, 0.3%;  $P < 0.01$ ; C). As for pig liver, weight increased linearly (44.0, 114.4, 144.5, 190.8 g;  $P < 0.01$ ), DM decreased linearly (29.3, 28.4, 26.2, 25.4%;  $P < 0.01$ ), N increased (6.7, 10.2, 10.1, 10.4;  $P < 0.01$ ; C), EE remained constant (6.8, 6.6, 6.8, 7.4%), total ash increased (4.53, 5.93, 6.16, 5.99%;  $P < 0.01$ ; Q), and the unaccounted portion decreased (47.0, 23.6, 24.0, 21.8%;  $P < 0.01$ ; C) with advancing age. The results characterize the nutrient composition change in pigs and associated liver from birth to 21 d of age, with the greatest change occurring in the first 7 d.

**Key words:** pigs, body composition, liver

**W197 Evaluating performance of dairy replacement calves housed in different group numbers with the same space/calf.** K. Shore\* and A. Roy, *Grober Nutrition, Cambridge, Ontario, Canada*.

Pre-weaned dairy replacement calves were evaluated for growth and health differences in different group sizes given the same space/calf (2.2 m<sup>2</sup>). Sixty-five calves ( $40.2 \pm 4.2$  kg BW;  $81 \pm 3.3$  cm height) were used in a 1-way ANOVA model and randomly assigned at arrival to one of 4 treatments: individual (I) pen ( $n = 23$ ), paired (P) pen ( $n = 5$ ; 10 calves), small group (SG) of 6 calves ( $n = 2$ ; 12 calves), large group (LG) of 11 calves ( $n = 2$ ; 22 calves). All calves were offered 9 L of milk replacer (1.35 kg of dry matter) on a daily basis. I and P calves were offered milk by pail; SG and LG groups were fed by

automatic calf feeder. All milk refusals were recorded; BW and heights were measured weekly. Health was evaluated daily using an adapted version of the University of Wisconsin calf scoring sheet. Calves were on trial for 10 wk, 8 wk on milk replacer, grain and hay and 2 wk on grain and hay only. Water was offered free choice to all calves. Body weight gain was not different between the groups over the 10 wk ( $I = 61.6 \pm 6.2$  kg;  $P = 57.0 \pm 10.9$  kg;  $SG = 62.0 \pm 12.6$  kg;  $LG = 64.4 \pm 7.6$  kg). There was no difference in ADG between groups throughout the 10 wk ( $I = 0.881 \pm 0.089$  kg/d;  $P = 0.829 \pm 0.147$  kg/d;  $SG = 0.885 \pm 0.179$  kg;  $LG = 0.920 \pm 0.109$  kg). There was a difference in height to start, such that I and P pens were taller however by 10 wk there was no difference in height ( $I = 98.2 \pm 1.3$  cm;  $P = 98.0 \pm 2.4$  cm;  $SG = 97.2 \pm 3.2$  cm;  $LG = 98.4 \pm 3.1$  cm). Health was measured in the number of events throughout the trial period, there was a difference between groups such that I (1.7) and P (1.2) were not different from each other but had less events ( $P = 0.04$ ) than group calves ( $LG = 2.6$ ;  $SG = 2.3$ ) ( $LG$  and  $SG$  were not different). Morbidity was highest in the first 2 wk as was mortality. Mortality was greatest in the P group. In summary, the number of calves in a group when given the same space did not affect growth parameters. The number of health events did not increase with more calves in a group.

**Key words:** calf, group size, milk replacer

**W198 Comparison of moisture determination methods for feed ingredients.** J. Y. Ahn\*, D. Y. Kil, and B. G. Kim, *Department of Animal Science and Environment, Konkuk University, Seoul, Republic of Korea.*

Accurate determinations of moisture content in feed ingredients and mixed diets are very important in animal nutrition experiments, feed sales, and feed storage conditions. While several methods are available for moisture determination in the literature, an oven method drying at 135°C for 2 h (AOAC Method 930.15) is one of the most widely employed procedures for feed moisture analysis. The objective of the present study is to compare oven-drying methods for determining 'loss-on-drying (LOD)' in feed ingredients and mixed diets. Feed ingredients tested in this study included corn, soybean meal (SBM), distillers dried grains with solubles (DDGS), permeate, whey, spray-dried porcine plasma (SDPP), and fish meal. A diet containing these ingredients was also analyzed for LOD. The LOD contents in these samples were determined by oven drying the samples at 135°C for 2 h or at 105°C for 3 h (NFTA 2.2.2.5) in triplicate. Additionally, the samples were dried at 105°C for 6, 9, 12, or 15 h. Drying the samples at 135°C for 2 h resulted in greater LOD contents in corn (12.3 vs. 11.9%), SBM (10.7 vs. 10.3%), DDGS (12.0 vs. 9.3%), permeate (7.5 vs. 3.1%), whey (8.9 vs. 3.0%), SDPP (7.8 vs. 7.5%), and fish meal (8.1 vs. 7.8%) compared with drying at 105°C for 3 h ( $P < 0.05$ ). After drying the samples at 105°C for 3 h, further drying DDGS, permeate, and whey for 12 more h caused more LOD (1.9, 2.3, and 2.3 percentage units, respectively;  $P < 0.01$ ). It was notable that the DDGS and permeate were considerably darkened by drying at 135°C for 2 h. The LOD contents in the individual ingredients were fairly additive: the difference between the calculated LOD contents in the mixed diet based on ingredient analysis and analyzed values ranged from -0.1 to 0.3 percentage units. Taken together, the method of oven-drying at 135°C for 2 h may be inappropriate for determining moisture content in some ingredients, such as DDGS, permeate, and whey, and thus, in diets containing these ingredients.

**Key words:** drying methods, feed ingredients, moisture content

**W199 The effect of diet and creep feed on feed intake by weanling pigs.** J. Shea, D. A. Gillis, and A. D. Beaulieu\*, *Prairie Swine Centre, Inc., Saskatoon, SK, Canada.*

A growth lag at weaning may be related to delayed initiation of feed intake. The objective of this experiment was to determine if creep feeding, or phase 1 diet complexity, could alleviate this. Trts, arranged as a  $2 \times 2 \times 3$  factorial, were 2 BW groups (heaviest [H] and lightest [L] pigs in a weaning group); creep (CR, weaning groups 1–8) or no creep (NoCR, weaning groups 9–15) and 3 diet regimens (complex d 0 to 1, simple d 2 to 14 [Com1]; complex d 0 to 4, simple d 5 to 14 [Com4] and simple d 0 to 14 [Sim14] post-weaning). Pigs were weaned at 28 d of age. Creep feed (commercial phase 1) was available for 1 wk pre-weaning. The heaviest and lightest pigs ( $n = 48$ /wk, 30% of available) from a weaning group were randomized within BW group to one of the diet trts and housed 4 per pen. Diets met nutrient requirements (NRC 1998) but only the complex diet contained whey, plasma, blood meal and fish meal. BW and ADFI were determined on d 0 (weaning), 1, 4, 7 and 14. Pens were videotaped for 24 h post-weaning and at each diet change to enumerate feeder approaches (head over a feeder) per hour. Data were analyzed as a split plot with creep as a main plot, pens within nursery as sub plots and feeder visits as a repeated measure. Post hoc, feeder visits were separated into active (1 to 6 and 18 to 24 h) and resting phases (7 to 17 h post-feeding). CR pigs were 130 g heavier on d 0 (8.49 kg,  $P = 0.35$ ) primarily due to H pigs (creep by BW,  $P = 0.01$ ). NoCR pigs grew faster overall (0.20 vs 0.17 kg/d;  $P = 0.05$ ). H pigs were heavier than L pigs on d 0 (10.40 vs 6.44 kg;  $P < 0.01$ ) but H pigs lost more weight and had lower ADFI during the initial 24 h post-weaning ( $P < 0.01$ ). Overall ADG was greatest in L pigs ( $P < 0.01$ ). Sim14 pigs lost more BW than Com1 or Com4 on d 0 ( $P = 0.02$ ). ADG, d 0 to 14, and final BW were unaffected by diet ( $P = 0.14$ ). During the first 24 h; NoCR had more feeder approaches than CR ( $P = 0.02$ ) and, significant only during the active phase, L pigs more feeder approaches than H. Com4 pigs had more feeder approaches on d 1 and 4 ( $P = 0.05$ ). Weaning wt, creep feed, and diet regimen had only modest effects on growth post-weaning, in pigs housed with minimal competition.

**Key words:** swine, creep feed, weaning

**W200 Effects of creep feed frequency on pre-weaning and post-weaning growth performance and behavior of piglet and sow.** J. H. Cho\*, S. Zhang, and I. H. Kim, *Dankook University, Cheonan, Choongnam, South Korea.*

This study was conducted to evaluate the effects of creep feeding frequency on pre- and post-weaning growth performance and behavior of piglet and sows. A total of 30 sows (Landrace  $\times$  Yorkshire) and their litters were employed in this study. Sows were randomly assigned with 1, 2 or 3 + parities into 1 of 3 treatments. Dietary treatments included: 1) CON (creep feeding 3 times daily), 2) TRT1 (creep feeding 4 times daily) and 3) TRT2 (creep feeding 5 times daily). The behavior of sows (nursery, eating and standing) and piglets (eating, sleeping and fighting) in each treatment was observed throughout the experiment. Each piglet was weighed on d 5, 10, 15, 21 and 7 after weaning to evaluate ADG. Sows and piglets were bled on the weaning day to evaluate the blood characteristic. Backfat and estrus interval were investigated to evaluate the effect of flavor supplementation on the sows. Varying creep feed frequency did not affect the pre-weaning and post-weaning piglet growth performance (pre-weaning: ADG = 214 vs 225, 231 g, ADFI = 15 vs 16, 15 g; post-weaning: ADG = 201 vs 206, 208 g, ADFI = 210 vs 214, 219 g,  $G:F = 0.957$  vs 0.962, 0.949;  $P > 0.05$ ). Pigs

with different frequency did not affect ( $P > 0.05$ ) the IgG (427.9 vs 456.2, 472.6 mg/dl), epinephrine (282.3 vs 277.7, 290.4 pg/ml), norepinephrine (886.2 vs 870.0, 868.2 pg/ml) and cortisol (1.93 vs 1.83, 1.97 $\mu$ g/dl) concentration, as well as the post-weaning diarrhea scores and behaviors in the current study. Moreover, creep feeding frequency did not affect ( $P > 0.05$ ) the weanling-to-estrus interval (5.36 vs 5.22, 5.28 d) and backfat loss (3.9 vs 3.4, 3.8 mm) of sows in the current study. Varying dietary frequency did not affect ( $P > 0.05$ ) the cortisol (6.72 vs 6.28, 6.47 $\mu$ g/dl), epinephrine (37.15 vs 34.58, 35.39 pg/ml)

and norepinephrine (202.8 vs 191.2, 188.4 pg/ml) in this study. No differences ( $P > 0.05$ ) in eating (18.6 vs 19.4, 18.4%), standing (23.8 vs 25.8, 24.6%), and lying times (57.6 vs 54.8, 57.0%) during lactation were noted in the current study. In conclusion, varying creep feeding frequency did not affect the performance and behavior of piglet and sow in this study.

**Key words:** behavior, creep feed, frequency