

AAs from 100% SID Lys:Leu to 130% SID Lys:Leu ($P < 0.0001$) at all protein concentrations. Conclusion: Diarrhoea outbreaks dropped by at least 50% by increasing the inclusion of crystalline AA by 30% compared with the “Ideal-protein” regardless of the protein concentration and is comparable with the effect of using pharmaceutical levels of zinc oxide (2,500 ppm), documented in other studies.

P55. A nutritional emulsifier improves growing-finishing pig performance

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Energy is a major cost factor in swine diets. Due to their high energy density, fats and oils are important sources of energy in feed formulation. Improving the digestibility of these raw materials is of much interest, especially from an economical point of view. Nutritional emulsifiers are able to improve the digestibility of fats and oils and therefore improve energy efficiency. Implementing these feed additives can result in more cost-effective diets without losing on growth. Two hundred and seventy pigs ($n = 270$), mixed-sex PIC CA 25 × 410 sire, were allocated to three groups: i) control group (CG), where pigs had continuous access to a corn-cassava-soy based diet (2400 kcal/kg) and ii) emulsifier group (EGR), where pigs had continuous access to an energy reduced diet (2350 kcal/kg) supplemented with a glyceryl polyethyleneglycol ricinoleate (GPGR) based nutritional emulsifier. The third group (EGT) of pigs received the control diet supplemented with the GPGR based nutritional emulsifier on top. At the start of the trial, pigs (63 days of age, 17.4 kg on average) were divided over 18 pens (6 per treatment) each containing fifteen animals. After a 77-day trial period growth parameters were analysed. Data were subject to ANOVA and mean comparison using Tukey's Test. SAS University edition was used in the analyses. The nutritional emulsifier had a significant positive effect on BW and % pigs > 700 g ADG (from birth) when applied on top (EGT). The nutritional emulsifier had a near significant positive effect on FCR when applied on top (EGT). The energy reduced diet group (EGR) did not show a negatively impacted growth compared to the control. The supplementation of a GPGR based nutritional emulsifier positively impacts growth of growing-finishing pigs when applied on top and has a compensating effect when applied in energy reduced diets.

P56. The digestibility of energy and nutrients and the efficiency of phytase to degrade phytate is influenced by pig body weight

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Phytase effects are usually evaluated in 20- to 40-kg pigs. It was hypothesized that pig body weight (BW) does not influence the positive effects of increasing dietary phytase on phytate degradation and nutrient digestibility. Eighteen ileal-cannulated pigs were allotted to a triplicated 6×3 Youden square design (6 diets; three 7-d collection periods). This design was repeated 4 times. Initial BW in each phase: 29.3, 53.6, 85.1, and 114.4 kg with 7-d resting period between phases. Six corn-soybean meal-based diets were formulated by including 0, 250, 500, 1,000,

2,000, or 4,000 phytase units/kg feed, assuming 0.16% total-Ca and 0.11% digestible-P release by phytase. Faecal (d 5) and ileal digesta (d 6–7) were collected in each period. Data were analysed as the interaction between phase and phytase level, and using contrast statements (linear and quadratic) per main effect. Regardless of BW, increasing phytase increased (quadratic; $P < 0.05$) apparent ileal digestibility (AID) of most amino acids (AA, +2.2%) and apparent total tract digestibility (ATTD) of Ca: +52%, P: +234%, K: +4%, and Mg: +83%, but decreased (quadratic; $P < 0.05$) AID and ATTD of gross energy (GE, -1.4%). In all phases, but to a different extent (interaction; $P < 0.05$), phytate decreased (quadratic; $P < 0.05$) -98, -95, -91, -90%, whereas inositol increased (quadratic; $P < 0.05$) +101, +90, +50, +12 fold in ileal digesta as phytase increased in phase 1–4, respectively. Regardless of phytase level, increasing BW increased (linear or quadratic; $P < 0.05$) AID of GE (+7%) and AA (+5%), and ATTD of GE (+4%), K (+10%), and Mg (+80%), but decreased ATTD of Ca (-27%), Na (-19%), and P (-9%). Likewise, ileal phytate increased (quadratic; $P < 0.05$) 2.3-fold, whereas ileal inositol decreased (linear; $P < 0.05$) 5-fold as BW increased. In conclusion, regardless of pig BW, increasing dietary phytase increased phytate degradation and inositol release in the small intestine, and consequently increased mineral and AA digestibility. However, nutrient digestibility and phytase efficiency to degrade phytate was influenced by pig BW.

P57. Phytate breakdown, nutrient digestibility, plasma metabolites, and bone ash of pigs fed increasing phytase levels for a long adaptation period

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Effects of phytase on pig nutrient digestibility are not consistent after a 5–7 d adaptation period. The hypothesis was that after a long 18-d adaptation period, phytase effects on nutrient and energy digestibility, plasma P and inositol, and bone ash of pigs are more consistent. Thirty-six ileal-cannulated pigs (body weight: 11.0 ± 0.6 kg) were allotted to 6 corn-soybean meal-based diets including 0, 250, 500, 1,000, 2,000, or 4,000 phytase units/kg feed in a completely randomized design. Phytase was assumed to release 0.16% total Ca and 0.11% digestible P in all diets. Blood (d -1 and 23), faeces (d 19–20), ileal digesta (d 21–22), and the 3rd and 4th metatarsals (d 23) were collected. Data were analysed using contrast statements (linear and quadratic) in SAS. Results indicated that increasing phytase level increased apparent ileal digestibility (AID) of Trp (+10%; quadratic; $P < 0.05$), Lys (+7%) and Thr (+8%; linear; $P < 0.05$). Increasing dietary phytase also increased AID and apparent total tract digestibility (ATTD) of Ca (+35%) and P (+164%; quadratic; $P < 0.05$) and increased ATTD of K (+13%) and Na (+8%; linear; $P < 0.05$), but did not influence ATTD of Mg or gross energy. Plasma P (+57%) and bone ash (grams; +78%; quadratic; $P < 0.05$) and plasma inositol (+28%; linear; $P < 0.05$) also increased with increasing phytase levels. Ileal concentrations of inositol phosphate (IP)-6 (95%) and IP-5 (94%; quadratic; $P < 0.05$) decreased as dietary phytase increased, whereas ileal inositol increased (37-fold; linear; $P < 0.05$) as dietary phytase increased. In conclusion, after 18-d adaptation period, increasing dietary phytase increased phytate degradation and inositol release in the small intestine, and consequently improved digestibility of 3 limiting amino acids, Ca, P, K, and Na, which further increased concentrations of bone ash and plasma P and inositol. This suggests that in phytase studies

the length of adaptation period may influence the consistency of the results.

P58. Assessment of the consequences of anaemia in sows on their reproductive performance and the long-term pigs' growth and haematological status

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Anaemia is frequent in neonatal pigs and few evidences suggest that sows are also affected but its consequences are poorly described. For instance, there is no information about the consequence of the maternal anaemia on the haematological status and growth performance of pigs after weaning. A total of 40 gilts and sows and their progeny weaned at 21 days were followed in order to monitor their haemoglobin concentration (Hb) with a non-invasive method of Hb estimation. For 19 females, the litters were divided into two groups depending on the iron supplementation (none vs an injection of 200 mg of intramuscular iron). The growth performance of those piglets were recorded until slaughter. Performance of animals were analysed with ANOVA to assess the effect of the sows' status whereas proportion of anaemic animals were analysed with Chi-squared test. Anaemia (Hb < 11 g/dl) has affected 37.5% of the sows at 65 days of gestation (G65) and 87.5% at weaning. New-born piglets from anaemic mothers at G65 tended to be more sensitive to anaemia (Hb < 9 g/dl) than the others (56.6 vs 43.0%, $P = 0.09$). Proportion of stillborn was significantly higher in the sows anaemic at G65 than others (13.3 vs 6.6%, $P = 0.03$). The haematological status of the piglets at weaning and at day 67 was not significantly affected by the sows' status. However, pigs born from anaemic sows at G65 grew significantly slower over the fattening period than the others (958 vs 910 g/d, $P < 0.05$). This study highlights that anaemia in sows is associated with deleterious long-term effects on the growth of offspring. Considering that muscle fibre hyperplasia mainly occurs before birth in swine, the long-term effect of the maternal status on the pigs growth could be related to the influence of iron on the functioning of skeletal muscle cells.

P59. Effect of dry vs liquid creep-feed on pre-weaning carbohydrase activities in piglets weaned at 4 or 5 weeks of age

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Weaning requires an increased activity level of carbohydrases, accommodating the transition from sow's milk to a vegetable-based diet (VBD). This could be achieved by the novel approach of combining the offering of dry (DF) or liquid (LF) creep feed during the suckling period, with an extended suckling period as digestive enzyme activity follows the age and not weight of the piglets. It was hypothesized that five week (W5) vs. four week (W4) old piglets, as well as piglets fed liquid (LF) vs. dry creep feed (DF) would display greater disaccharidase activity prior to weaning. From a larger growth performance experiment

including 12,469 piglets exposed to either LF or DF in the pre-weaning period, 15 piglets from each group, W4DF, W4LF, W5DF and W5LF, were weighed and subsequently euthanized two–three days before weaning. Samples from the proximal part of the small intestine (SI) were collected and analysed for maltase, lactase and sucrase activity. The data were analysed using the ANOVA function in R with age, feed type and their interaction as fixed effects. As expected piglets were heavier in the W5 than the W4 group (8.33 vs. 6.78 kg BW, $P \leq 0.05$), whereas no difference between LF and DF piglets were found (7.44 vs. 7.68 kg BW). In terms of enzyme activity only age seemed to have an impact, as, not surprisingly, W4 compared with W5 piglets tended to display higher activity of lactase (2301 vs. 1575 U/mg SI tissue, $P = 0.06$). The lack of difference in enzyme activity between DF and LF fed piglets corresponded with lack of difference in dry matter (DM) intake, indicating digestive enzyme activity in the two groups had been equally stimulated. However, it cannot be excluded that overall DM intake from creep feed was relative low, possibly being a consequence of high sow milk intake.

P60. The effect of weaning age and feed type on disaccharidase activity in early post weaned piglets

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The transition from suckling to weaning is associated with a growth check in piglets, because of a change in environment and thereby a feed refusal and diminished enzyme activity to digest vegetable-based dry diets (VBD). The latter related to an immature gut, especially in terms of activity of digestive enzymes, due to early weaning age. It was hypothesized that piglets weaned in week 5 (W5) vs. week 4 (W4), as well as piglets fed liquid (LF) vs. dry feed (DF) would display greater disaccharidase activity. From a larger growth performance experiment including 12,469 piglets exposed to either LF or DF in the pre weaning period, 15 piglets from each group, W4DF, W4LF, W5DF and W5LF, were weighed and subsequently euthanized five days after weaning. Samples from the proximal part of the small intestine (SI) were collected and analysed for maltase, lactase and sucrase activity. The data were analysed using the ANOVA function in R with weaning week, feed type and their interaction as fixed effects. As expected piglets were heavier in the W5 than the W4 group (9.35 vs. 7.11 kg BW, $P \leq 0.05$), as well as piglets in the LF group were heavier than piglets in the DF group (8.55 vs. 7.90 kg BW, $P \leq 0.05$). With respect to the enzyme activity only weaning week had an effect, where piglets in the W5 groups displayed higher activity of maltase (2874 vs. 1931 U/mg SI tissue, $P \leq 0.05$) and sucrase (906 vs. 644 U/mg SI tissue, $P \leq 0.05$). Although LF promoted greater weight gain in the early post-weaning period, it was not due to an increased activity of investigated disaccharidases, which did not differ between LF and DF pigs. A longer pre-weaning period resulted in improved enzyme activity, likely a consequence of the animals being older and thus having a longer exposure to VBD.

P61. Impact of feeding level on nutrient digestibility and concentrations of plasma metabolites in transition sows

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