

compared to those fed no added Cu. Furthermore, pigs fed added Cu had decreased ( $P = 0.032$ ; 0.618 vs. 0.935) relative mRNA expression of intestinal fatty acid binding protein (iF-ABP) compared to those fed no added Cu. In summary, 150 mg/kg added TBCC did not significantly affect overall growth but did influence diet digestibility and some gut morphology or mRNA expression measurements. Feeding a high byproduct diet decreased yield, caloric efficiency, and diet digestibility.

**Key Words:** finishing pigs, copper, fiber

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### 300 Low calcium levels improve growth in piglets

**after weaning.** L. Blavi\*, D. Solà-Oriol, J. F. Pèrez, *Animal Nutrition and Welfare Service, Department of Animal and Food Sciences, Universitat Autònoma de Barcelona, Bellaterra (08193), Spain.*

Piglets have a low acidification capacity that may promote digestive disorders and diarrhea. The inclusion of  $\text{CaCO}_3$  and ZnO with high acid-binding capacity in weaning diets can aggravate the problem. It was hypothesized that reducing the levels of Ca from 0.95% to 0.35% (no addition of  $\text{CaCO}_3$ ) may improve the growth of piglets after weaning. A total of 240 piglets were distributed into 3 treatments during the pre-starter phase (0 to 14 d postweaning; 8 replicates per treatment). Treatments were based on 3 different Calcium levels: High (HCa) with 0.95% of Ca (1.55%  $\text{CaCO}_3$ ), Medium (MCa) with 0.65% of Ca (0.78%  $\text{CaCO}_3$ ) and Low (LCa) with 0.35% of Ca (0%  $\text{CaCO}_3$ ). The diets contained 2520 Kcal NE/kg, 19.7% CP, and 1.39 Lys. Feed Intake and individual BW were registered on d 0, 7, and 14. The initial BW was  $7.69 \pm 0.01$  kg for each treatment. Piglets fed HCa showed lower BW, ADG and G:F ratio than piglets with LCa and MCa (Table 300). These results show that feeding piglets low inclusion or no  $\text{CaCO}_3$  increased growth, suggesting that the reduction of  $\text{CaCO}_3$  allow a better digestion of feed during the pre-starter phase.

**Key Words:** calcium, pigs, weaning

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### 301 Effects of increasing zinc from zinc sulfate or zinc hydroxychloride on finishing pig growth performance and carcass characteristics.

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A variety of zinc sources are available for use in swine trace mineral premixes. However, more research is needed to compare zinc sources and dietary levels in growing and finishing pigs in a commercial environment. A total of 1008 pigs [TR4 × (Fast Large White × L02 PIC); initially 32.1 kg BW] were used in a 103-d growth study to determine the effects of Zn

source and level on finishing pig growth performance and carcass characteristics. The 6 dietary treatments were arranged as a  $2 \times 3$  factorial with main effects of Zn source ( $\text{ZnSO}_4$  Agrium Advance Technology, Loveland, CO or Zn Hydroxychloride; IntelliBond Z<sup>®</sup>; Micronutrients, Indianapolis, IN) or level (50, 100, or 150 ppm added Zn). There was no additional Zn provided from the trace mineral premix. There were 21 pigs per pen and 8 pens per treatment. Overall, there were no Zn source × level interactions observed for ADG or ADFI, however G:F tended (linear,  $P = 0.069$ ) to be poorer when pigs were fed increasing levels of Zn from  $\text{ZnSO}_4$ . Overall, there were no Zn source effects for growth performance observed. For Zn level main effects, ADG was maximized (quadratic,  $P = 0.007$ ) and ending BW was heaviest (quadratic,  $P = 0.011$ ) when diets contained 100 ppm of Zn. Feed efficiency was poorer (linear,  $P = 0.006$ ) when pigs were fed increasing levels of Zn. For carcass characteristics, pigs fed diets with Zn Hydroxychloride had heavier ( $P = 0.041$ ) HCW than those fed  $\text{ZnSO}_4$ . Also carcass yield increased (linear,  $P = 0.027$ ) when pigs were fed increasing levels of Zn and HCW was maximized (quadratic,  $P = 0.006$ ) when diets contained 100 ppm of Zn. These results suggest that a total of 100 ppm added Zn is enough to maximize ending BW, ADG and HCW, but G:F worsened as Zn level increased. Zn source did not impact growth performance; however, pigs fed Zn Hydroxychloride had increased HCW compared to those fed  $\text{ZnSO}_4$ .

**Key Words:** finishing pig, zinc sulfate, zinc hydroxychloride

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### 302 Lysozyme as an alternative to antibiotics in swine feed.

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Antibiotics have been fed at subtherapeutic levels to swine as growth promoters for more than 60 yr, and the majority of swine produced in the U.S. receive antibiotics in their feed at some point in their production cycle. These compounds benefit the producers by minimizing production losses by increasing feed efficiency and decreasing susceptibility to bacterial infection and disease. However, many countries, including all of the European Union, have banned the use of antibiotics as growth promotants in animal agriculture. Due to the perceived risk of bacterial resistance to antibiotics important in human medicine, swine producers are currently under tremendous pressure to eliminate subtherapeutic antibiotic use. Recent Federal Drug Administration guidance (No. 209 and 213) are designed to limit the use of medically important antibiotics in animal agriculture in the U.S. Lysozyme, also known as muramidase, is a naturally occurring enzyme found in bodily secretions such as tears, saliva, and milk and is a good replacement for traditional antibiotics. It functions as an antimicrobial agent by cleaving the peptidoglycan component of bacterial cell walls, which leads to cell death. While the