

## Improving disease outcomes by feeding a zinc amino acid complex during subclinical and clinical *Lawsonia intracellularis* infection

Authors: A. Mueller<sup>1</sup>, N. Winkelman<sup>1</sup>, Z. Rambo<sup>2</sup>, W. Schweer<sup>2</sup> C. Rapp<sup>2</sup>

<sup>1</sup>Swine Services Unlimited Inc, USA; <sup>2</sup>Zinpro Corporation, USA

**Background and Objectives:** *Lawsonia intracellularis* is prevalent worldwide, affecting 40-50% of growing pigs globally. In the United States alone, more than 90% of pigs are seropositive for *L. intracellularis*. This disease is estimated to cost \$3 to \$12 USD per affected pig depending on disease severity. Current strategies for controlling ileitis include vaccination, antibiotic treatment, or their combination. Two studies were conducted to determine 1) immune outcomes in response to zinc source and 2) a feed program plus vaccine program utilized to control *L. intracellularis*.

**Materials and Methods:** In the first study, 54 four-week-old pigs were assigned to one of three treatments with 18 pigs per treatment. Treatments included a negative (NEG) and positive (POS) control supplemented with 125 ppm Zn as zinc sulfate, and a group that was supplemented with 50 ppm Zn as zinc amino acid complex and 75 ppm Zn as zinc sulfate (AvZn; 125 ppm Zn total). All pigs except NEG pigs, were challenged with  $2 \times 10^9$  *L. intracellularis* organisms. Six pigs per treatment were euthanized at 14, 21, and 28 days post infection (dpi) to determine gross lesions and immune response to infection.

In the second study, 216 five-week-old pigs were assigned to one of three treatments with 9 pigs per pen. Treatments included a control (CON; n=4 pens), vaccinated (VAC; n=10 pens), and vaccinated plus zinc amino acid complex in the diet (ZnAA; n=10 pens). CON and VAC diets were supplemented with 100 ppm Zn as zinc sulfate, and ZnAA diets were supplemented with 50 ppm Zn as zinc amino acid complex and 50 ppm Zn as zinc sulfate (100 ppm Zn total). All VAC and ZnAA pigs were vaccinated with Enterisol<sup>®</sup> Ileitis (Boehringer Ingelheim, USA) at placement; three weeks later all pigs were challenged with  $1 \times 10^8$  *L. intracellularis*. Pig diarrhea score, performance and mortality were monitored until pigs reached market weight.

**Results:** In study 1, no pigs exhibited clinical signs of ileitis; however, challenged pigs were fecal positive and gross lesions were detected. Lesion severity was reduced at 28 dpi in AvZn pigs, and only 33% of AvZn pigs expressed lesions at 28 dpi. Microscopic lesions were reduced from 83% in POS pigs to 17% in AvZn pigs. Additionally, AvZn pigs seroconverted at an earlier timepoint (14 dpi) compared to POS pigs ( $P < 0.05$ ) and T cell counts in infected ileum crypts were greater at 21 dpi in AvZn fed pigs compared to CON pigs.

In the second study, 5 CON pigs exhibited severe diarrhea, 3 of which died or were euthanized. Conversely, no ZnAA pigs exhibited severe diarrhea throughout the finishing period. ZnAA also improved pig performance from 15 to 49 dpi ( $P \leq 0.09$ ). Mortality was numerically reduced in ZnAA pigs compared to VAC and CON (1.1, 5.6, and 8.3%, respectively).

**Conclusions and discussion:** Feeding 50 ppm Zn as zinc amino acid complex appears to aid the pigs' ability to respond to a *L. intracellularis* infection, leading to decreased lesion prevalence and severity. Additionally, feeding zinc amino acid complex in combination with a vaccination protocol can moderate the clinical impact of disease, reducing diarrhea score severity and mortality through the finishing period. This reduction in mortality resulted in savings of \$5 to \$7 USD per pig marketed.