PLASMA PROTEINS: AN ALTERNATIVE FOR ZINC OXIDE
SPRAY DRIED PORCINE PLASMA IS A CONSISTENT ALTERNATIVE TO ZINC OXIDE IN WEANED PIG DIETS

High levels of Zinc Oxide (ZnO) are commonly used in nursery pig diets to manage the effects of pathogenic E. coli on pig growth and health. The EU recently established regulations to restrict use of ZnO at high levels in pig feed within 3 years due to concerns on environmental pollution and the prevalence of antibiotic-resistant pathogens. Supplementing nursery pig feed with Spray Dried Porcine Plasma (SDPP) is a viable option for replacing use of ZnO in feed to manage pathogenic E. coli.

SDPP SUBSTITUTING ZNO IN WEANED PIGS

Weaned pigs (7.1 kg BW) were fed with either 0 or 5% SDPP or 2500 ppm ZnO or a combination of 5% SDPP and ZnO for 14 days and control diet until they averaged 30.5 kg. There were 42 replicate pens per treatment (364 pigs/group). Both SDPP and ZnO improved growth compared with control treatment and there was an additive effect when both products were used together.

Even more, many studies have demonstrated an improvement in piglet performance with the use of Spray Dried Porcine Plasma (SDPP) in feed. These studies reported that SDPP reduces the incidence of post-weaning diarrhea and greater efficacy of SDPP has been described in younger pigs which have a less mature immune system or in pigs kept under less sanitary conditions. Therefore, SDPP is considered a viable alternative to antibiotic growth promoters and to Zinc Oxide (ZnO) used at pharmacological levels (Pérez-Bosque et al., 2016).
SDPP SUPPORTING GROWTH OF WEANED PIGS INFECTED WITH E. COLI

Ten day old weaned pigs were fed experimental diets for 14 days. At day 7 pigs were infected with E. coli K88. Pigs fed diets with SDPP compared to diets with 2,880 mg/kg ZnO during the initial two weeks post-weaning had similar average daily gain (ADG) and performance. In addition, diarrhea scores 24 hours after E. coli infection were less severe and pig mortality was significantly lower for pigs fed diets with SDPP or ZnO compared to the control diet.

PIGLETS’ PERFORMANCE WITH THE USE OF SDPP

The study was conducted in a French experimental pig farm with normal stressing conditions. Weaned pigs (25 day old; 7.0 kg BW) were fed during first 7 days with either 0 or 5% SDPP or 2500 ppm ZnO or a combination of 5% SDPP and ZnO and 0 or 3% SDPP or 2500 ppm ZnO or a combination of 3% SDPP and ZnO during following 11 days. There were 8 replicate pens per treatment (17 pigs/pen; 136 pigs/group). Iso-energetic and Iso-lysine diets (1.66 and 1.46% respectively or pre-starter and started diets) were used between treatments. Piglets were fed ad libitum during the entire study. No effect on mortality and number of days with diarrhea was observed between treatments. The following table reports the performance results obtained during the 18 days of study.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>SDPP</th>
<th>ZnO</th>
<th>SDPP + ZnO</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW initial, kg</td>
<td>6.9</td>
<td>7.0</td>
<td>7.0</td>
<td>7.0</td>
</tr>
<tr>
<td>BW final, kg</td>
<td>13.2</td>
<td>13.6</td>
<td>12.7</td>
<td>12.7</td>
</tr>
<tr>
<td>ADG, g</td>
<td>347</td>
<td>370</td>
<td>316</td>
<td>320</td>
</tr>
<tr>
<td>ADFI, g</td>
<td>378</td>
<td>403</td>
<td>357</td>
<td>366</td>
</tr>
<tr>
<td>FCR</td>
<td>1.09</td>
<td>1.09</td>
<td>1.13</td>
<td>1.15</td>
</tr>
</tbody>
</table>

**Means in a row that do not have a common superscript differ (p<0.05).**

Pigs fed with SDPP had improved BW compared with pigs in the other treatments and increased average daily gain (ADG) and average feed intake (ADFI) compared with treatments containing ZnO. However, the inclusion of ZnO significantly reduced the feed intake and therefore the ADG and performance of the animals. The addition of SDPP in conjunction with ZnO did not change the negative effect of ZnO in consumption. No differences on feed conversion was found between treatments.

**CONCLUSIONS**

- SDPP is a viable option for replacing use of pharmaceutical levels of ZnO in nursery pigs, even under enteric challenging conditions.
- SDPP is an environmentally friendly, natural feed ingredient that does not promote development of antibiotic resistant pathogens.
- Under normal sanitary conditions, sometimes, the addition of ZnO at high level could have negative effect on pig performance due to its reduction in feed intake, however, the use of SDPP improved growth performance during this period.
Effects of spray dried bovine plasma in diets with or without pharmacological ZnO on weanling pig growth performance and fecal characteristics

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Background and Objectives
Spray dried plasma protein (SDP) is a functional ingredient commonly used in early nursery diets as a source of highly digestible protein and immunoglobulins. Zhe et al. (2021) reported that SDP from porcine origin had increased ADG and ADFI, similar to diets containing pharmacological levels of Zn from ZnO; however, when SDP was sourced from poultry, there was no benefit. The impact of bovine-sourced SDP (SDBP) in relation to pharmacological Zn is unknown and it is further unclear if the SDP response is interactive with pharmacological Zn. Thus, the objective was to determine the effects of SDBP in diets with or without pharmacological Zn on weanling pig growth and fecal characteristics.

Materials and Methods
A total of 300 pigs (241 × 600; DNA, Columbus, NE; initially 5.8 kg and 21 d of age) were used in a 38-d trial to evaluate the effect of ZnO and SDBP in nursery pig diets. At placement, pens of pigs were weighed and allotted to 1 of 4 dietary treatments in a RCBD with bodyweight as the blocking factor. Treatments were arranged in a 2 × 2 factorial with main effects of Zn level (high and low) and SDBP (with or without) with 12 replicates/dietary treatment (5 pigs/pen). Treatment diets were fed in 2 phases (phase 1: d 0 to 9; phase 2: d 9 to 24) with a common diet (low Zn without SDBP) fed from d 24 to 38. Fecal samples and scores were collected on d 9 and 24. High Zn diets had 3,000 and 2,000 ppm of Zn in phase 1 and 2 diets, respectively and low Zn diets had 110 ppm of Zn. In the SDBP diets, SDPP was included at 5% in phase 1 and 2% in phase 2. To equalize SBM, MePro (fermented vegetable protein source; Prairie Aquatech) was included at 7 and 2% in phase 1 and 2, respectively, for non-SDBP. Diets were fed in pellet form in phase 1, and meal form in phase 2 and 3. Pen weights and feed disappearance were measured on d 0, 9, 24, and 38 to determine ADG, ADFI, and G:F. Data analyzed as a RCBD for two-way ANOVA (R Core Team, 2019) with pen as EU. Interactive and main effects of Zn level and SDBP were tested.

Results
There were no Zn × SDPP interactions for growth performance observed. In Phase 1, SDBP tended to increase ADG but decrease G:F (P < 0.07) and increased d 9 BW and ADFI (P < 0.04) while diets with high Zn had improved ADG, d 9 BW, and G:F (P < 0.02). In Phase 2 and the overall treatment feeding period, high Zn increased ADG and ADFI (P < 0.001). In the overall treatment feeding period G:F was also improved (P < 0.01) with high Zn. Overall (d 0 to 38), high Zn improved ADG, G:F, and final BW (P < 0.03). There was a tendency for a SDBP x ZnO interaction (P < 0.067) for fecal dry matter where pigs fed diets with SDBP, but without ZnO had lower fecal dry matter compared to all other treatments.

Conclusion and Discussion
The response of SDBP and pharmacological Zn were independent. SDBP resulted in improved ADG, ADFI, and BW after phase 1, and even though not significant, a 0.45 kg heavier pig at the end of the study. Pharmacological ZnO improved performance during the entire treatment feeding period and resulted in a 0.74 kg heavier pig at the end of the study. In this study, SDBP improved performance of pigs immediately after weaning but did not elicit the longer duration benefits observed with pharmacological Zn.

References

Abstract Presented at Zero Zinc Summit 2022.
Starting pigs with spray dried plasma as an alternative for high levels of zinc oxide. A review.
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Background and Objectives
Many factors influence post-weaning stress including environment, husbandry, genetics, and disease that reduce feed intake. Getting weaned pigs started on feed is critical for maintaining gut health and performance. High doses of zinc oxide (up to 3,000 ppm) added to feed have been used to mitigate post-weaning diarrhea and increase performance; however, in various regions zinc oxide is being reduced due to regulations. Alternatives to zinc oxide are warranted to evaluate if performance and health can be maintained when high doses of zinc oxide are reduced. Spray dried plasma (SDP) has demonstrated improved feed intake and performance along with reduced severity of diarrhea in post-weaning pigs. Thus, the objective of this paper is to summarize results of two studies that evaluated the potential use of feeding bovine SDP in low zinc diets on performance and health in the early post-weaning feed phases.

Material and Methods
Experiment 1 (Campbell et al., 2022). Pigs (1,161 Camborough F1 female x 800 boar line) were weaned at 20 ± 1 d of age (body weight: 5.6 ± 0.7 kg), divided within gender, and allotted to a randomized block design using 30 pens in two rooms with 31, 32, or 33 pigs per pen. Feed phases (P) were P1 days 0-7 and P2 days 7-21, postweaning. Feed treatments were: 1) control (LZ) with low zinc (P1-P2, 150 ppm); 2) LZ + 5% SDP P1; and 3) LZ + 5% SDP P1, 2.5% SDP P2. Experiment 2 (APC report, 2022). Pigs (600 PIC 800 X Fast 276) were weaned at 21 ± 1 d of age (body weight: 6.4 ± 0.8 kg) and randomly allotted to 20 pens with 30 pigs per pen (15 barrows and 15 gilts per pen). Feed phases (P) were P1 days 0-7 and P2 days 7-14, postweaning. Feed treatments were: 1) control (LZ) with low zinc (P1-P2, 120 ppm); and 2) LZ + 5% SDP P1, 2.0% SDP P2.

Results
Experiment 1. In P1, the LZ control pigs did not grow well as indicated by low average daily gain (ADG: 39 g/d). Pigs fed LZ + SDP had increased (P = 0.01) ADG compared to LZ. During P2, pigs fed both SDP feed treatments had higher (P < 0.01) ADFI and ADG, while feed efficiency was similar (P = 0.11) to LZ. Experiment 2. During P1, LZ + SDP had higher ADG than LZ (104 vs. 78 g/d). BW at d 14 was highest for LZ + SDP compared to LZ (9.32 and 9.24 kg, respectively). Overall P1 and P2, pigs fed LZ + SDP had higher ADG than LZ (207 vs. 201 g/d). Overall, the effect of SDP was not different but was numerically higher. Also, total individual medical treatments were higher for LZ fed pigs (n=25) versus pigs fed LZ + SDP (n=14) through the initial 14 days postweaning.

Conclusion
In the current experiments, adding SDP to LZ diets improved growth performance and BW by the end of P2 and reduced the number of medical treatments compared to LZ diets.

References

Abstract Presented at Zero Zinc Summit 2022.
LOCATIONS
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