RESEARCHBRIEF

SWINE

NEW RESEARCH SHOWS THAT INCLUDING SPRAY DRIED PLASMA IN PHASE 1 DIETS HELPS SUPPORT GUT HEALTH AND MAINTAIN GROWTH PERFORMANCE DURING THIS CRITICAL WINDOW

BACKGROUND

The post-weaning period is associated with physiological stress, reduced feed intake, and increased susceptibility to digestive disturbances in pigs. Nutritional strategies during this period often focus on maintaining growth performance while supporting intestinal health. Spray-dried plasma (SDP) is commonly included in nursery diets, while reduced crude protein (CP) diets are sometimes used to help manage post-weaning diarrhea. This study evaluated how SDP and dietary CP level interact during the early post-weaning period.

OBJECTIVE

To evaluate the effects of spray-dried plasma and reduced crude protein in phase-1 diets on growth performance, diarrhea scores, intestinal morphology, and immune-related parameters in weanling pigs.

Bailey, et al., (2025). Effects of the combination of spray dried plasma and reduced crude protein in diets on growth performance, diarrhea scores, gut morphology, and immune parameters of weanling pigs. Can. J. Anim. Sci. 105: 1–12 (2025) | dx.doi.org/10.1139/cjas-2025-0061

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STUDY DESIGN

Animals:

- 160 weaned pigs
- Initial body weight: 5.89 ± 0.39 kg
- Weaning age: 20 ± 2 days

Experimental Design:

- Randomized complete block design
- 32 pens (5 pigs per pen)

Feeding Phases:

- **Phase 1:** Days 1–14 post-weaning
- **Phase 2:** Days 15–28 (common diet without SDP)

Dietary Treatments (Phase 1)

Crude Protein	Spray-Dried Plasma
18.5% CP	0% SDP
18.5% CP	6% SDP
23.0% CP	0% SDP
23.0% CP	6% SDP

MEASUREMENTS

Researchers evaluated:

- **Growth Performance:**
  - Average daily gain (ADG)
  - Average daily feed intake (ADFI)
  - Gain-to-feed ratio (G:F)
  - Body weight
- **Health Indicators:**
  - Visual diarrhea scores
- **Intestinal Morphology:**
  - Villus height
  - Crypt depth
  - Mucosal thickness
- **Immune-related Parameters:**
  - Plasma cytokines
  - Mucosal cytokines
  - Secretory immunoglobulin A (sIgA)
- **Blood Parameters:**
  - White blood cell counts
  - Neutrophils and lymphocytes
  - Plasma urea nitrogen
  - Albumin and total protein

KEY OBSERVATIONS

- **Growth Performance:**
  - During the first 14 days post-weaning, pigs fed diets containing spray-dried plasma had higher ADG, ADFI, and gain-to-feed ratio than pigs fed diets without plasma.
  - Pigs fed reduced crude protein diets had lower ADG and feed efficiency during the phase-1 period compared with pigs fed the higher crude protein diets.
- **Diarrhea Scores:**
  - Lower crude protein diets were associated with lower diarrhea scores during the first two weeks post-weaning.
  - Spray-dried plasma inclusion did not significantly influence diarrhea scores under the conditions of this study.
- **Intestinal Morphology:**
  - Inclusion of spray-dried plasma was associated with greater villus height in the jejunum.
  - In the ileum, villus height responses varied depending on the interaction between crude protein level and plasma inclusion.
- **Immune and Cytokine Measures:**
  - Several mucosal and systemic cytokine concentrations varied depending on dietary treatment.
  - Spray-dried plasma inclusion was associated with changes in certain systemic cytokine measurements.
- **Blood Parameters:**
  - White blood cell counts were not influenced by crude protein concentration or spray-dried plasma inclusion.
  - Plasma urea nitrogen differed depending on the interaction between crude protein level and spray-dried plasma inclusion.

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Table 4: Main effects of crude protein (CP) concentration and inclusion of spray dried plasma (SDP) in phase 1 diets on growth performance parameters of weaned pigs. *, †

Item	CP, %		SDP, %		Pooled	*P* value‡	
SDP, %	18.5	23.0	–	6.0	SEM	CP	SDP
Days 1 to 14							
Initial BW, kg	5.88	5.89	5.89	5.88	0.12	0.464	0.659
ADG, g	92^{b}	118^{a}	86^{b}	123^{a}	10.61	0.003	<0.001
ADFI, g	158^{b}	180^{a}	153^{b}	185^{a}	5.66	0.010	<0.001
G:F	0.56^{b}	0.65^{a}	0.55^{b}	0.66^{a}	0.08	0.039	0.009
Final BW, kg	7.19^{b}	7.56^{a}	7.12^{b}	7.63^{a}	0.12	0.003	<0.001
Days 15 to 28							
ADG, g	430	439	463^{a}	406^{b}	12.19	0.591	0.002
ADFI, g	548	575	574	549	16.65	0.160	0.176
G:F	0.78	0.76	0.80^{a}	0.74^{b}	0.03	0.311	<0.001
Final BW, kg	13.72^{z}	14.25^{y}	14.11	13.86	0.26	0.079	0.388
Days 1 to 28							
ADG, g	261^{z}	278^{y}	275	264	9.02	0.095	0.318
ADFI, g	353^{z}	377^{y}	364	367	10.91	0.071	0.792
G:F	0.73	0.73	0.75^{a}	0.72^{b}	0.04	0.934	0.031

^{a,b}Means within a row lacking a common superscript letter differ ($P < 0.05$).
^{y,z}Means within a row lacking a common superscript letter differ ($0.05 \leq P < 0.10$).
*Data are least square means of 16 observations for all treatments.
†ADFI, average daily feed intake; ADG, average daily gain; BW, body weight, G:F, gain to feed ratio.
‡There was no interaction between level of CP and SDP for any of the growth performance parameters; therefore, the interaction term was removed from the final model and only main effects are shown.

Table 8: Influence of crude protein (CP) concentration and inclusion of spray dried plasma (SDP) to phase 1 diets fed to weaned pigs on plasma concentrations of immunoglobulin A (g/mL) and cytokines (ng/mL). *, †

Item	18.5% CP		23.0% CP		Pooled	*P* value‡			Day		Pooled	
SDP, %	–	6.0	–	6.0	SEM	C	S	C × S	7	14	SEM	*P* value
IgA	145.8	112.1	148.0	158.8	19.8	0.175	0.517	0.215	124.9	157.5	14.57	0.028
Cytokines												
IFN-γ	39.65^{y}	8.08^{z}	14.35^{yz}	12.01^{yz}	8.29	0.209	0.051	0.090	28.27	8.77	4.42	<0.001
IL-1α	0.22	0.10	0.17	0.11	0.03	0.396	<0.001	0.136	0.23	0.07	0.03	<0.001
IL-1β	0.72	0.15	0.45	0.15	0.10	0.169	<0.001	0.161	0.45	0.29	0.06	0.008
IL-1Ra	1.33	1.49	1.25	0.94	0.16	0.056	0.648	0.141	1.42	1.09	0.11	0.044
IL-2	1.19^{a}	0.15^{b}	0.64^{b}	0.16^{b}	0.13	0.044	<0.001	0.040	0.62	0.45	0.10	0.215
IL-4	4.07	0.62	2.45	0.88	0.63	0.281	<0.001	0.140	3.01	1.00	0.42	<0.001
IL-6	0.50^{y}	0.10^{z}	0.31^{yz}	0.13^{z}	0.07	0.230	<0.001	0.084	0.37	0.15	0.05	<0.001
IL-8	0.25	0.19	0.17	0.24	0.04	0.687	0.967	0.153	0.33	0.10	0.02	<0.001
IL-10	1.89^{y}	0.40^{z}	1.19^{yz}	0.42^{z}	0.22	0.121	<0.001	0.090	1.24	0.71	0.16	0.008
IL-12	0.87	0.92	0.91	0.72	0.09	0.290	0.301	0.102	0.80	0.91	0.07	0.035
IL-18	2.89^{y}	0.77^{z}	1.87^{yz}	0.85^{z}	0.30	0.134	<0.001	0.079	2.06	1.13	0.21	0.001
TNF-α	0.85^{y}	0.63^{yz}	0.49^{z}	0.83^{y}	0.18	0.630	0.737	0.089	1.23	0.17	0.12	<0.001

^{a,b}Means within a row lacking a common superscript letter differ ($P < 0.05$).
^{y,z}Means within a row lacking a common superscript letter differ ($0.05 \leq P < 0.10$).
*Data are least square means of 6–8 observations per treatment.
†IFN-γ, interferon-gamma; IgA, immunoglobulin A; IL-, interleukin-; IL-1Ra, interleukin-1 receptor antagonist; TNF-α, tumor necrosis factor-α.
‡*P* values were calculated to test the main effect of crude protein concentration (C) and inclusion of spray dried plasma (S) and the interaction between crude protein and spray dried plasma (C × S).

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CONCLUSION

Including spray-dried plasma (SDP) in diets for newly weaned pigs improved growth performance and reduced systemic inflammation. Lowering dietary crude protein reduced diarrhea but also reduced growth efficiency and intestinal villus height unless SDP was included, indicating that SDP can help support gut structure and overall piglet health when protein levels are reduced.

BOTTOM LINE

Adding 6% spray-dried plasma to weanling pig diets improved growth performance and reduced systemic inflammation, while lowering dietary crude protein reduced diarrhea but could compromise gut structure, unless plasma was included in the phase 1 diet.

Plasma inclusion *in diets for newly weaned pigs improved growth performance and reduced systemic inflammation.*

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