NURSERY PIG PERFORMANCE IN RESPONSE TO MEAL AND PELLETED DIETS FED WITH IRRADIATED OR NON-IRRADIATED SPRAY-DRIED ANIMAL PLASMA

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Summary

A 25-d trial was conducted to determine the effects of feeding meal and pelleted diets, with or without irradiated spray-dried animal plasma (SDAP; AP 920), on the growth performance in nursery pigs. A total of 192 pigs (initially 13.2 ± 1.9 lb and 21 ± 3 d of age) were used, with 6 pigs per pen and 6 pens per treatment. Pigs were randomly allotted in a 2 × 2 factorial to pens, blocked by weight, and randomly allotted to one of four dietary treatments. The main effects were diet form, meal or pellet, and either irradiated SDAP or non-irradiated SDAP. The experimental treatments consisted of a single diet that was fed in either meal or pelleted form, with or without irradiation of SDAP for Phase 1 (d 0 to 11), and a common diet for Phase 2 (d 11 to 25). Pig fed pelleted diets from d 0 to 3 had a greater ADG, ADFI, and improved F/G ($P<0.03$) than did pigs fed meal diets. Irradiation of SDAP had no effect on performance from d 0 to 3; for d 3 to 11, however, there was a diet form × SDAP irradiation interaction ($P < 0.01$), and for d 0 to 11 there was interaction for ADG and F/G ($P<0.07$). Pigs fed irradiated SDAP in meal form had similar growth performance to those fed pelleted treatments. For producers that manufacture their own Phase 1 diet in meal form, use of irradiated SDAP can result in performance equal to that of nursery pigs fed a pelleted diet.

(Key Words: Nursery Pig, Meal, Pellet, Spray-dried Animal Plasma, Irradiation.)

Introduction

The importance of starting pigs on feed is always emphasized to ensure that the pigs get off to a good start, and is critical for long-term performance. Specialty proteins such as spray-dried animal plasma (SDAP), fish meal, and dried whey are used to stimulate feed intake and start pigs on feed. These ingredients are very expensive and, with the added cost of pelleting, the alternative of feeding meal-based diets is being re-evaluated. Recent studies suggest that nursery pigs started on pelleted diets have increased gain and feed intake, compared with that of pigs started on meal diets. The heat and conditioning of ingredients before pelleting may be contributing to the improved performance seen when using pellets. It has also been demonstrated that irradiation of SDAP significantly reduces bacteria counts and results in an improved nursery pig performance. Therefore, the objective of our study was to determine the effects on nursery pig performance of feeding regular or irradiated SDAP in either meal or pelleted starter diets.

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Procedures

A total of 192 pigs (initially 13.2 ± 1.9 lb and 21 ± 3 d of age) were used in a 25-d growth assay, with 6 pigs per pen and 6 pens per treatment. Pigs were randomly allotted to pens and blocked by weight and allotted to one of four dietary treatments arranged in a 2 × 2 factorial. Main effects included diet form, meal or pellet, and either non-irradiated or irradiated SDAP. The experimental treatments consisted of one diet (Table 1) fed in either meal or pelleted form, with or without irradiation of SDAP (AP 920; American Protein, Ames, IA) for Phase 1, d 0 to 11. For Phase 2, (d 11 to 25), all pigs were fed a common diet in meal form. The SDAP was irradiated at the Iowa State University Linear Accelerator Facility, with an average irradiation dose of 11.92 kGy. All diets were manufactured at Kerber Milling, Emmetsburg, IA. Total bacterial plate counts and total coliform counts were analyzed on the plasma sources and each of the diets after manufacturing. Data was analyzed by using Proc MIXED procedures in SAS 8.1.

Results and Discussion

Irradiation of the SDAP reduced the total bacterial plate count (Table 2). Pelleting also reduced the total plate count, compared with that of the non-irradiated SDAP and the meal diets. The meal diet with the irradiated plasma source had only a slightly reduced total bacterial plate count, compared with that of the non-irradiated meal diet. Pigs fed pelleted diets from d 0 to 3 had greater ADG and ADFI, and an improved F/G ($P<0.03$), compared with those fed meal diets. Irradiation of SDAP had no effect on pig performance from d 0 to 3; for d 3 to 11, however, there was a diet form × SDAP irradiation interaction ($P<0.01$), and for d 0 to 11 there was an interaction for ADG and F/G ($P<0.07$). Pigs fed irradiated SDAP in meal form had similar performance to those fed the pelleted treatments. From d 11 to 25, all pigs were fed a common diet, in meal form; pigs previously fed the non-irradiated SDAP meal diet had reduced growth performance through d 25, compared with performance of those fed the irradiated SDAP meal diet and both of the pelleted treatments.

In conclusion, pigs feed pelleted diets had greater improvement in ADG, ADFI, and F/G ($P<0.03$) from d 0 to 3 than did pigs fed both meal treatments, but pigs fed the diet with irradiated SDAP had similar overall growth performance to that of pigs fed both of the pelleted treatments. For producers that manufacture their own Phase 1 diet in meal form, use of irradiated SDAP can result in performance equal to that of nursery pigs fed a pelleted diet.

Table 1. Composition of Diets (As-fed Basis)

Item	d 0 to 11[a]	d 11 to 25[b]
Corn	44.02	53.71
Soybean meal (46.5% CP)	19.40	31.54
Spray dried whey	20.00	10.00
Spray dried animal plasma	5.00	---
Menhaden fish meal	5.00	---
Soy oil	3.00	---
Monocalcium P (21% P)	0.75	1.50
Limestone	0.65	0.95
Salt	0.25	0.35
Vitamin premix	0.25	0.25
Trace mineral premix	0.15	0.15
Antibiotic[c]	0.70	0.70
Zinc oxide	0.38	---
L-threonine	0.08	0.13
L-lysine HCl	0.23	0.33
DL-methionine	0.15	0.15
Total	100.00	100.00
Calculated analysis		
Total lysine, %	1.50	1.30
ME, kcal/lb	1,552	1,474
Protein, %	22.6	20.9
Ca, %	0.88	0.84
P, %	0.80	0.76
Available P, %	0.57	0.46
Lysine:calorie ratio, g/Mcal	4.38	4.00

[a]The Phase 1 (d 0 to 11) diet was fed in either meal or pelleted form, with irradiated SDAP or non-irradiated SDAP.
[b]The Phase 2 (d 11 to 25) diet was a common diet fed to all pigs in meal form.
[c] Neo-Terramycin® 10/10.

Table 2. Aerobic Bacteria Concentration

Item	Total Plate Count, CFU/g	Total Coliform Count, CFU/g
Spray-dried animal plasma		
Non-irradiated	1.1×10^5	$< 1.0 \times 10^1$
Irradiated[a]	$< 1.0 \times 10^1$	$< 1.0 \times 10^1$
Diet with non-irradiated plasma		
Meal	2.6×10^4	3.9×10^2
Pellet	2.0×10^3	$< 1.0 \times 10^1$
Diet with irradiated plasma		
Meal	2.1×10^4	$< 1.0 \times 10^1$
Pellet	4.8×10^3	$< 1.0 \times 10^1$

[a]Spray-dried animal plasma was irradiated at 11.92 kGy.

Table 3. Effects of Meal and Pelleted Diets, with or without Irradiation of Spray-dried Animal Plasma[a]

	Non-irradiated Plasma		Irradiated Plasma			Probability, P <		
Data	Meal	Pellet	Meal	Pellet	SE	Diet Form	Plasma Irradiation	Diet Form × Plasma Irradiation
d 0 to 3								
ADG	0.50	0.65	0.48	0.68	0.05	0.002	0.95	0.71
ADFI	0.29	0.37	0.26	0.32	0.03	0.01	0.85	0.67
F/G	0.58	0.57	0.64	0.55	0.02	0.03	0.45	0.12
d 3 to 11								
ADG	0.67	0.85	0.87	0.88	0.04	0.003	0.001	0.01
ADFI	0.94	0.99	1.03	0.99	0.03	0.86	0.16	0.12
F/G	1.40	1.19	1.18	1.12	0.03	0.0001	0.0001	0.01
d 0 to 11								
ADG	0.62	0.79	0.77	0.83	0.03	0.001	0.003	0.05
ADFI	0.76	0.82	0.83	0.82	0.03	0.12	0.37	0.15
F/G	1.22	1.04	1.09	0.99	0.02	0.003	0.0001	0.07
d 11 to 25								
ADG	0.88	0.96	0.96	0.95	0.03	0.10	0.08	0.03
ADFI	1.13	1.28	1.25	1.27	0.04	0.01	0.08	0.04
F/G	1.30	1.33	1.31	1.34	0.01	0.09	0.85	0.80
d 0 to 25								
ADG	0.78	0.89	0.88	0.90	0.03	0.002	0.01	0.02
ADFI	0.99	1.09	1.09	1.09	0.04	0.05	0.08	0.06
F/G	1.27	1.23	1.23	1.21	0.02	0.07	0.06	0.57

[a]A total of 192 pigs (six pigs per pen and 8 pens per treatment) with an average initial weight of 13.9 ± 1.8 lb were used in the study.