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Effect of Lactation Diets Containing a Cheese Co-product on Sow and Litter Performance

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Summary

A total of 86 sows (DNA 241, DNA Genetics, Columbus, NE) were used to determine the effects of a cheese co-product (Pro88; Key Manufacturing, Paris, IL) added to lactation diets on sow and litter performance. Sows, in three separate farrowing groups (approximately 43 ± 1 sows per group), were moved into the farrowing house and blocked by parity on d 112 ± 1 of gestation. They were then assigned to one of two dietary treatments that consisted of a control diet or the control with 4% added cheese co-product. Diets were formulated to be balanced for amino acids and minerals, but not for energy. There were 44 sows fed the control diet and 42 sows fed the diet with the cheese co-product. Sows were fed 6 lb of the control diet until farrowing and then were switched to their assigned treatment diet on d 2 of lactation after cross-fostering was completed. Sows were given *ad libitum* access to their assigned treatment diet until weaning (approximately d 18 of lactation). The addition of a cheese co-product in lactation diets did not affect sow weight, backfat, or loin depth change from entry to weaning. As expected, there were no differences after cross-fostering for the d 2 litter size, litter weight, and litter weight coefficient of variation (CV) as treatment diets had not been fed. Dietary treatment did not affect sow ADFI or their subsequent wean-to-estrus interval. Litter size at weaning, prewean mortality, and piglet and litter weights at weaning were not affected by dietary treatment. In conclusion, the addition of a cheese co-product in lactation diets did not influence sow or litter performance.

Introduction

Recent increases in litter size have resulted in efforts to increase lactation feed intake and, subsequently, milk production to support litter weight gain. Ingredients in lactation diets should be nutrient-dense and highly digestible without negatively affecting feed intake. The cheese co-product used in this study (Keys Manufacturing, Paris, IL) has a relatively high protein, fat, and mineral content. Previous research[3] suggested that the cheese co-product has a high standardized ileal digestibility (SID) of amino acids

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[3] Mallea, A. P., M. S. F. Oliveira, D. A. Lopez, and H. H. Stein. 2023. Nutritional value of a new source of cheese coproduct fed to weanling pigs. J. Anim Sci. 101:skad107. doi:10.1093/jas/skad107.

and NE content, which would make it an attractive ingredient to use in lactation diets. While some research has been conducted utilizing the cheese co-product in weanling pig diets, to our knowledge, no studies have been conducted with the cheese co-product in sow lactation diets. Therefore, the objective of this study was to determine the effect of adding a cheese co-product in lactation diets on sow and litter performance.

Materials and Methods

The Kansas State University Institutional Animal Care and Use Committee approved the protocol used in this experiment. This study was conducted at the Kansas State University Swine Teaching and Research Center. Sows were housed in individual farrowing stalls measuring 6 × 8 ft, including sow and piglet area. Each crate was equipped with an automatic dry self-feeder (Gestal Quattro Opti, Jyga Technologies, St-Lambert-de-Lauzon, Quebec, Canada) and a cup waterer.

Animals and diets

A total of 86 mixed-parity sows (DNA 241; DNA Genetics, Columbus, NE) and litters (DNA 241 × 600) were used across three batch-farrowing groups (approximately 43 ± 1 sows per farrowing group). Sows were moved into the farrowing house on d 112 ± 1 of gestation. From entry until farrowing, all sows were fed 6 lb of the control lactation diet. After farrowing and cross-fostering were complete, sows were provided *ad libitum* access to their treatment diet, which consisted of either a control diet or the control diet with 4% added cheese co-product (Pro88; Key Manufacturing, Paris, IL; Table 1). Diets were formulated to be balanced for amino acids and minerals using NRC (2012) nutrient loading values for ingredients, except the cheese co-product, whose nutrient loading values were provided by the supplier. Diets were not balanced for energy. There were 44 sows fed the control diet, and 42 sows fed the diet containing the cheese co-product. No creep feed was offered to piglets throughout lactation. All diets were manufactured at the Kansas State University O.H. Kruse Feed Technology Innovation Center, Manhattan, KS.

Upon entry into the farrowing house and at weaning, sow weight, caliper score, backfat, and loin depth were measured. Caliper scores were taken at the last rib. Backfat and loin depth were measured at the last rib, 2.5 inches from the midline on the right side of the sow using an IBEX Pro ultrasound system (E.I. Medical Imaging, Loveland, CO). On d 1, litters were processed, and individual piglet weights were collected along with the sows' post-farrowing weight. Then on d 2, all litters were equalized across treatments to 12 to 16 pigs per sow. Piglets were individually weighed on d 2 after equalization, d 10 of lactation, and at weaning. Daily feed disappearance was recorded for each sow using a Gestal volumetric feeder. At the beginning of each farrowing group, three feeders from each treatment were calibrated to account for the bulk density of each diet. Any feed wastage taken out of the feed pan was weighed and subtracted from the feed disappearance recorded for that sow. At the end of each group, all feed pans were dumped. The remaining feed was weighed and subtracted from the feed disappearance for the sow. After weaning, the sows' wean-to-estrus interval was recorded.

Statistical analysis

Performance data were analyzed as a generalized block design using R software, version 4.4.0 (R Core Team, Vienna, Austria). Sow was considered the experimental unit. Treatment served as a fixed effect with a random effect of block (sow parity and group). Pre-wean mortality was analyzed using a binomial distribution. Results were considered

significant at $P \leq 0.05$ and marginally significant at $0.05 < P \leq 0.10$. Two of the original 44 sows on the cheese co-product treatment were taken off test due to illness.

Results and Discussion

There were no differences in sow body weight, backfat, loin depth, or caliper score at entry or weaning, or in the change from entry to weaning (Table 2). No difference was observed for sow ADFI from farrowing to d 10, d 10 to weaning, or from farrowing to weaning. There were no differences observed for the subsequent wean-to-estrus interval between sows fed the control diet or those fed the cheese co-product. For litter performance, there were no differences in litter size on d 2, d 10, or at weaning (Table 3). There were also no differences observed for litter weight, litter weight CV%, mean piglet weight, litter ADG, piglet ADG, or pre-weaning mortality throughout the study. In conclusion, there was neither a positive nor a negative effect on sow and litter performance with the addition of 4% cheese co-product in the lactation diet.

Table 1. Composition of lactation diets (as-fed basis)

Ingredient, %	Control	Cheese co-product
Corn	73.95	74.16
Soybean meal, 46.5% CP	21.95	17.74
Cheese co-product[1]	---	4.00
Calcium carbonate	1.43	1.33
Monocalcium P, 21.5% P	0.70	0.80
Salt	0.50	0.50
L-Lys-HCl	0.43	0.43
DL-Met	0.09	0.09
L-Thr	0.17	0.17
L-Trp	0.04	0.05
L-Val	0.25	0.25
KSU Sow VTM	0.50	0.50
Total	100.00	100.00
Calculated analysis		
SID AA, %		
Lys, %	1.05	1.05
Ile:Lys	56	56
Leu:Lys	125	126
Met:Lys	31	32
Met and Cys:Lys	54	54
Thr:Lys	64	64
Trp:Lys	20	20
Val:Lys	85	85
His:Lys	38	38
Total Lys, %	1.09	1.09
ME, kcal/lb	1,488	1,513
NE, kcal/lb	1,120	1,149
SID Lys:NE, g/Mcal	4.25	4.15
CP, %	17.4	17.0
Ca, %	0.82	0.82
P, %	0.50	0.52
STTD P, %	0.40	0.40

[1] Pro88 Key Manufacturing, Paris, IL.

Table 2. Evaluation of a cheese co-product in lactation diets on sow lactation performance[1]

	Treatment diet[2]			
	Control	Cheese co-product	SEM	*P* =
Count, n	44	42	---	---
Parity	2.0	2.0	0.37	0.882
Lactation length, d	18.7	18.7	0.30	0.798
Sow BW, lb				
Entry	542.7	545.5	22.46	0.681
Farrow	492.8	499.6	19.98	0.351
Wean	476.5	483.5	18.39	0.328
Change (farrow to wean)	-16.3	-16.2	3.32	0.984
Change (entry to wean)	-66.0	-61.8	6.47	0.455
Sow backfat, mm				
Entry	14.4	14.7	0.40	0.547
Wean	12.5	12.8	0.40	0.604
Change (entry to wean)	-1.9	-1.9	0.31	0.895
Sow loin depth, mm				
Entry	50.6	51.8	1.04	0.303
Wean	46.4	47.3	0.80	0.335
Change (entry to wean)	-4.2	-4.4	0.74	0.808
Sow caliper score, units				
Entry	15.3	15.6	0.30	0.390
Wean	13.6	13.9	0.39	0.354
Change (entry to wean)	-1.7	-1.6	0.25	0.890
Sow ADFI, lb				
d 2 to 10	12.0	11.6	0.52	0.545
d 10 to wean	18.6	17.9	0.71	0.409
Farrow to wean	15.0	14.4	0.43	0.181
Wean to estrus interval, d	5.4	5.4	0.12	0.916

[1] A total of 86 mixed-parity sows (Line 241, DNA, Columbus, NE) and litters were used from d 2 post-farrow until weaning. Litters were cross-fostered to equalize litter size up to 48-h post-farrowing.
[2] Sow treatment consisted of a control diet or the control diet with 4% added cheese co-product (Pro88; Keys Manufacturing, Paris, IL) fed from d 2 post-farrow until weaning.

Table 3. Evaluation of a cheese co-product in lactation diets on litter performance[1]

	Treatment diet[2]			
	Control	Cheese co-product	SEM	*P* =
Litter size, n				
d 2	14.5	14.4	0.59	0.906
d 10	14.1	13.8	0.57	0.704
Wean	14.0	13.7	0.57	0.657
Litter weight, lb				
d 2	53.4	53.3	1.98	0.977
d 10	112.2	110.2	3.35	0.582
Wean	165.1	163.2	4.06	0.611
Mean piglet BW, lb				
d 2	3.7	3.7	0.13	0.564
d 10	7.9	8.0	0.20	0.538
Wean	11.7	11.9	0.33	0.384
Litter ADG, lb/d				
d 2 to 10	6.87	6.76	0.238	0.632
d 10 to wean	7.40	7.36	0.281	0.866
d 2 to wean	7.11	7.04	0.231	0.724
Piglet ADG, lb/d				
d 2 to 10	0.49	0.49	0.017	0.984
d 10 to wean	0.53	0.54	0.021	0.544
d 2 to wean	0.51	0.51	0.018	0.676
Litter weight CV, %				
d 2	18.8	18.9	0.74	0.922
d 10	19.9	18.3	0.92	0.155
Wean	19.8	18.2	0.86	0.129
Preweaning mortality, d 2 to wean, %	3.2	4.6	2.80	0.457

[1] A total of 86 mixed-parity sows (Line 241, DNA, Columbus, NE) and litters were used from d 2 post-farrow until weaning. Litters were cross-fostered to equalize litter size up to 48-h post-farrowing.

[2] Sow treatment consisted of a control diet or the control diet with 4% added cheese co-product (Pro88; Keys Manufacturing, Paris, IL) fed from d 2 post-farrow until weaning.