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Abstract

A total of 317 lactating sows was fed either a corn-soybean meal diet (l.0%lysine) or a diet with a portion of the soybean meal replaced with 5% select menhaden fish meal on an equal lysine basis. Adding 5% select menhaden fish meal had no overall effect on sow or litter performance. Composition of milk samples collected between d 14 and 16 of lactation was not affected by dietary treatment.; Swine Day, Manhattan, KS, November 21, 1996

Keywords

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EFFECTS OF SELECT MENHADEN FISH MEAL FED DURING LACTATION ON SOW AND LITTER PERFORMANCE[1]

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Summary

A total of 317 lactating sows was fed either a corn-soybean meal diet (1.0% lysine) or a diet with a portion of the soybean meal replaced with 5% select menhaden fish meal on an equal lysine basis. Adding 5% select menhaden fish meal had no overall effect on sow or litter performance. Composition of milk samples collected between d 14 and 16 of lactation was not affected by dietary treatment.

(Key Words: Sows, Lactation Diets, Select Menhaden Fish Meal.)

Introduction

Soybean meal is the predominate protein source used in lactation diets in the U.S. Unfortunately, limited information exists to evaluate the effects of highly palatable and digestible protein sources such as select menhaden fish meal on sow feed intake and performance. Select menhaden fish meal is used widely as a specialty protein source in diets for weanling pigs (weaning to 25 lb) because of its effects on feed intake and growth performance. Therefore, the objective of this experiment was to determine the effects of adding 5% select menhaden fish meal to lactation diets on sow and litter performance.

Procedures

A total of 317 sows (PIC Line, C-15) was used. The experiment was conducted from July to September, 1995, on a 1,600 sow commercial swine farm in northeast Kansas. During gestation, all sows were fed 4 lb/d of a milo-soybean meal gestation diet (.65% lysine) formulated to exceed NRC (1988) nutrient estimates for amino acids, vitamins, and minerals. Feed intake was increased gradually to 6 lb/d during the last 21 days of gestation. Sows were assigned randomly to dietary treatments when they were moved into the farrowing house on or at about d 110 of gestation. Parity distribution was equalized between treatments, and sows were fed 6 lb/d of the experimental diets from d 110 of gestation until farrowing. During lactation, all sows were allowed ad libitum access to feed and water and were fed at least three times per day. The two dietary treatments consisted of a corn-soybean meal control diet or a diet with 5% select menhaden fish meal replacing soybean meal on a lysine basis (Table 1). Both diets contained 2.5% added soybean oil and were formulated to contain 1.0% lysine. Feed intake during lactation was recorded daily. Sows were scanned for last rib fat depth and scored for body condition (5-point scale with 1= thin and 5= obese) at farrowing and at weaning (d 20). Litters were standardized between treatments within 24 hours of parturition

[1]The authors thank Zapata Proteins Co., Mandeville, LA for providing the select menhaden fish meal and partial financial support and Keesecker Agri-Business for use of facilities and animal care.

and weighed after equalization. Number of pigs and litter weights were recorded at weaning. Pigs were weaned at approximately d 20 of lactation, and sows were moved to a gestation building where they were monitored for estrus with daily boar exposure.

Subsequent reproductive performance was recorded. The gestation diet and feeding management were identical to those described previously. Criteria measured were days to estrus, farrowing rate, total number of pigs born, and number of pigs born alive.

Table 1. Composition of Experimental Diets[a]

Ingredient, %	Control	Select Menhaden Fish Meal
Corn	64.81	68.85
Soybean meal (46.5% CP)	27.84	19.60
Select menhaden fish meal	---	5.00
Soybean oil	2.50	2.50
Monocalcium phosphate	2.56	2.07
Limestone	1.14	.83
Salt	.50	.50
Sow add pack	.25	.25
Vitamin premix	.25	.25
Trace mineral premix	.15	.15
Total	100.00	100.00

[a]The lactation diets were formulated to contain 1.0% lysine, .94% valine, 1.0% Ca, and .9% P.

Milk samples were collected from 16 randomly selected third parity sows (8 per treatment) between d 14 and 16 of lactation and analyzed for total whole milk composition including crude protein, dry matter, ash, lipid, and lactose.

In the statistical analysis, number of pigs equalized per litter, weight after equalization, and lactation length were used as covariates. In addition, sows were divided into two groups based on parity. First and second parity sows were combined into one group, and parity three, four, five, and six sows were combined into the second. This grouping arrangement (approximately 50% in each group) provided a sufficient number of observations within each parity group to evaluate the effects of added select menhaden fish meal based on sow parity. The statistical model evaluated treatment by parity group interactions; however, there no significant interactions ($P<.10$) were observed.

Results and Discussion

Adding 5% select menhaden fish meal to the lactation diet had no effect ($P>.25$) on sow feed intake (Table 2). However, sows fed added select menhaden fish meal had numerically greater feed intake throughout the experiment. The average number of pigs per litter after equalization was 10.33 vs 10.21 for sows fed the control and added select menhaden fish meal diets, respectively. Adding 5% select menhaden fish meal to the lactation diet had no effect ($P>.10$) on number of pigs weaned, pig survival from birth to weaning, and pig or litter weaning weights. Sow body condition scores decreased from farrowing to weaning but were unaffected by dietary treatment. Sows fed 5% select menhaden fish meal tended ($P<.10$) to have greater last rib fat depth at farrowing and at weaning; however, no difference was observed for change in backfat thickness based on dietary treatment.

Although the difference was not statistically significant, sows fed select menhaden fish meal tended to have a higher farrowing rate and .3 pigs more total pigs born (10.86 vs 11.17, respectively). However, number of pigs born alive was similar (10.28 vs 10.23) for sows fed the control or select menhaden fish meal diet.

Composition of milk samples collected between d 14 and 16 of lactation was not affected ($P>.10$) by dietary treatment (Table 3).

No parity × dietary treatment interactions were observed for any of the response criteria. However, to determine if parity affected the results with menhaden fish meal, we divided the sows into two parity groups; first and second parity sows in one group (Table 4), and sows greater than second parity into a second group (Table 5). First

and second parity sows fed select menhaden fish meal tended to have numerically greater (3%) feed intake (d 0 to 14; $P<.11$) than sows fed the control diet. However, litter and pig weaning weights were not affected by dietary treatment. Sows fed select menhaden fish meal tended to have greater backfat thickness at farrowing and weaning but also tended ($P<.14$) to loose less backfat during lactation. The slightly greater backfat thickness at farrowing could have been a random, nontreatment-related effect, because sows were assigned to their respective treatments at farrowing. However, the trend for higher feed intakes by sows fed select menhaden fish meal could have contributed to the decreased backfat loss during lactation. First and second parity sows fed select menhaden fish meal tended to have greater subsequent farrowing rate (72.74 vs 60.89%; $P>.13$) compared with those fed the control diet. This response also may be related to slightly greater feed intake and less loss of backfat thickness during lactation.

Surprisingly, older parity sows (>2) fed 5% menhaden fish meal during lactation had decreased pig and litter weaning weight and litter weight gain when compared to those fed the control diet ($P<.05$). No differences were observed between sows fed the two diets for other response criteria (Table 5).

In conclusion, these results suggest that 5% select menhaden fish meal can replace soybean meal in a lactation diet with mixed effects on sow or litter performance. In first and second parity sows, select menhaden fish meal tended to increase daily feed intake and improve farrowing rate; however, in older parity sows, addition of select menhaden fish meal reduced litter weaning weights. These responses were not of a large enough magnitude to indicate a parity × select menhaden fish meal interaction, and the overall data showed no differences in sow or litter performance. In addition, no differences were observed in milk composition or subsequent reproductive performance.

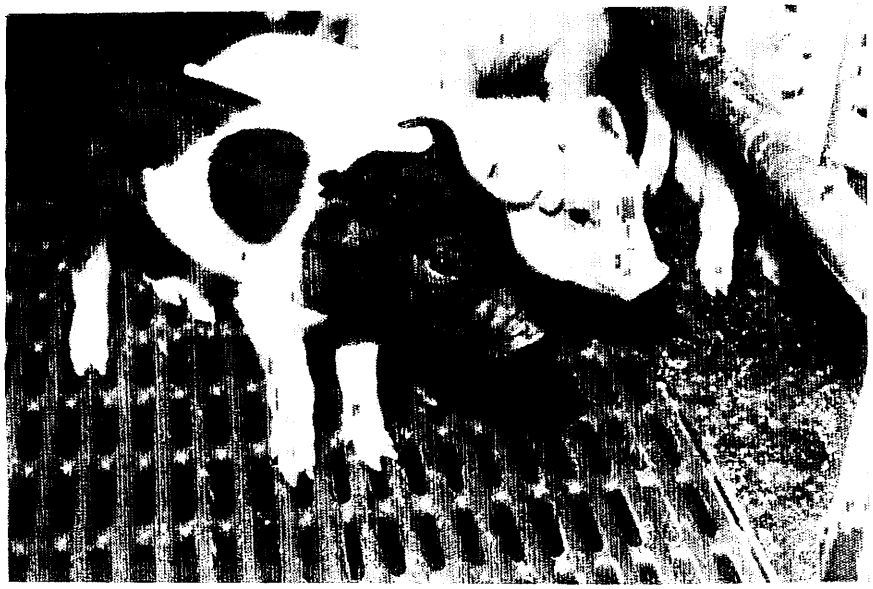

Table 2. Effects of Select Menhaden Fish Meal Fed during Lactation on Sow and Litter Performance (All Parities)[a]

Item	Control	Select Menhaden Fish Meal	CV	P-Value
No. of sows	164	153		
ADFI, lb				
d 0 to 7	9.92	10.08	19.5	.4845
d 7 to 14	12.08	12.32	18.3	.3427
d 0 to 14	11.00	11.20	16.6	.3449
d 0 to 21	11.44	11.66	14.7	.2830
No. pigs equalized per litter	10.32	10.22	7.4	.1994
No. pigs weaned per litter	9.80	9.76	7.4	.6092
Survivability, %	95.60	95.25	7.1	.6570
Litter wt gain, lb	90.19	87.40	16.1	.1566
Litter wt at birth, lb	37.77	36.25	14.8	.0170
Litter wt at weaning, lb	127.22	124.43	13.4	.1566
Pig wt gain, lb	9.21	8.96	16.1	.1433
Pig wt at birth, lb	3.62	3.62	1.5	.4947
Pig wt at weaning, lb	13.00	12.77	11.0	.1724
Sow body condition[b]				
Postfarrowing	3.38	3.45	18.4	.3528
Weaning	3.23	3.23	17.6	.9570
Change	.156	.219	246.6	.2448
Sow last rib fat depth, mm				
Postfarrowing	19.94	20.75	19.4	.0801
Weaning	17.95	19.03	20.3	.0145
Change	1.98	1.69	106.2	.2091
Subsequent reproductive performance				
Days to estrus	5.21	5.46	73.5	.5845
Farrowing rate, %	67.6	72.3	65.9	.3788
Total born per litter	10.86	11.17	31.5	.5249
Born live per litter	10.28	10.23	31.1	.9122

[a]Covariates used in the statistical analysis were: days of lactation, pigs equalized, and parity.
[b]Body condition based on five-point scale (1 = thin and 5 = obese).

Table 3. Analysis of Whole Fresh Sow Milk on D 14 to 16 of Lactation[a]

Analyses, %	Control	5% Menhaden Fish Meal	CV	P-Value
Lipid	6.54	6.04	16.63	.3788
Dry matter	17.38	16.55	6.16	.1471
Ash	0.77	0.76	153.04	.3137
Crude protein	5.92	5.70	8.96	.4232
Lactose	69.39	70.96	5.16	.7889

[a]Values represent the means of eight (control) and seven (select menhaden fish meal) observations per treatment.

Table 4. Effects of Select Menhaden Fish Meal Fed during Lactation on Sow and Litter Performance (Parities 1 and 2)[a]

Item	Control	Select Menhaden Fish Meal	CV	P-Value
No. of sows	86	82		
ADFI, lb				
d 0 to 7	9.48	9.93	19.09	.1334
d 7 to 14	11.26	11.73	19.36	.1907
d 0 to 14	10.37	10.83	16.72	.1087
d 0 to 21	10.86	11.21	15.50	.1984
No. pigs weaned per litter	9.73	9.78	7.70	.7221
Survivability, %	94.88	95.33	7.42	.6911
Litter wt gain, lb	84.27	84.11	20.50	.9519
Litter wt at weaning, lb	119.35	119.18	14.46	.9519
Pig wt gain, lb	8.67	8.61	17.30	.8333
Pig wt at birth, lb	3.43	3.43	1.50	.7191
Pig wt at weaning, lb	12.30	12.24	11.85	.7963
Sow body condition[b]				
Postfarrowing	3.20	3.21	17.65	.8915
Weaning	3.01	3.01	17.15	.9903
Change	.19	.20	228.63	.9083
Sow last rib fat depth, mm				
Postfarrowing	18.90	19.96	17.83	.0581
Weaning	16.78	18.22	19.32	.0090
Change	2.11	1.74	78.78	.1366
Subsequent reproductive performance				
Days to estrus	5.27	5.38	84.30	.8724
Farrowing rate, %	60.89	72.74	70.90	.1208
Total born per litter	11.00	10.62	32.50	.5875
Born alive per litter	10.42	9.81	31.80	.3428

[1]Covariates used in the statistical analysis were: days of lactation, pigs equalized, treatment, and parity.
[2]Body condition based on five-point scale (1 = thin and 5 = obese).

Table 5. Effects of Select Menhaden Fish Meal Fed during Lactation on Sow and Litter Performance (Parities > 3)[a]

Item	Control	Select Menhaden Fish Meal	CV	P-Value
No. of sows	78	71		
ADFI, lb				
d 0 to 7	10.39	10.22	19.74	.6102
d 7 to 14	12.92	12.91	17.18	.9673
d 0 to 14	11.66	11.56	16.40	.7670
d 0 to 21	12.06	12.09	13.71	.9289
No. pigs weaned per litter	9.87	9.75	6.88	.2816
Survivability, %	96.37	95.26	6.50	.3000
Litter wt gain, lb	96.16	90.65	17.36	.0494
Litter wt at weaning, lb	135.39	129.88	12.23	.0494
Pig wt gain, lb	9.74	9.28	14.74	.0570
Pig wt at birth, lb	3.84	3.84	1.33	.4924
Pig wt at weaning, lb	13.73	13.32	10.14	.0831
Sow body condition[b]				
Postfarrowing	3.58	3.69	18.89	.3327
Weaning	3.46	3.45	17.95	.9963
Change	.12	.24	265.74	.1519
Sow last rib fat depth, mm				
Postfarrowing	21.03	21.52	20.54	.5241
Weaning	19.17	19.82	20.88	.3561
Change	1.85	1.63	135.90	.6035
Subsequent reproductive performance				
Days to estrus	5.16	5.54	59.60	.4933
Farrowing rate, %	74.21	71.51	61.37	.7245
Total born per litter	10.77	11.65	30.38	.2044
Born alive per litter	10.17	10.61	30.27	.4907

[a]Covariates used in the statistical analysis were: days of lactation, pigs equalized, treatment, and parity.
[b]Body condition based on five-point scale (1 = thin and 5 = obese).