# THE EFFECTS OF ADDITIONAL NIACIN DURING GESTATION AND LACTATION ON SOW AND LITTER PERFORMANCE

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## Summary

One hundred and twenty-one first-litter sows were utilized to evaluate the effects of additional niacin on sow and litter performance through two parities. The control diet provided sows with 50 mg/d niacin during gestation and 100 mg/d niacin during lactation. Dietary treatments were formulated to provide sows with either 5 or 10 times the level of supplemental niacin in the control diet. Litter size was equalized within dietary treatment by 24 hr after farrowing. During the first parity, total pigs born, number of pigs born alive, and pigs equalized per litter decreased then increased as dietary niacin level increased. However, sows fed additional niacin tended to wean more pigs per litter and, therefore, had greater pig survival from birth to weaning. Pig and litter weights at weaning were increased by increasing levels of additional niacin. Sows fed the intermediate level of added niacin had the greatest weight and backfat loss during lactation. During the second parity, additional niacin had no effect on the total number of pigs born or number born alive. However, the number of pigs equalized per litter increased then decreased as niacin intake increased. There were no differences in the number of pigs weaned, pig survival, pig weight, and litter weight at weaning from dietary treatment. These results suggest that first-litter sows fed the intermediate level of additional niacin during gestation and lactation had fewer total pigs born and born alive. However, these sows had more pigs at weaning, better pig survival, and heavier litters at weaning than those fed the 50/100 mg/d niacin gestation/lactation sequence. In addition, the decrease in pigs born and born alive during the first parity was not observed in the second parity.

(Key Words: Sow, Performance, Niacin, Gestation, Lactation.)

## Introduction

In 1986, we reported results of a study designed to evaluate the effects of additional niacin on sow and litter performance (KAES Report of Progress #507). Since that time, a second group of 60 sows has been put through the identical protocol to help better determine the effects of additional niacin on sow and litter performance. The results reported herein contain the combined data from both 1986 and the second group of sows in the study just completed.

## Procedures

One hundred twenty-one sows were assigned at breeding to one of three gestation-lactation treatments. Control sows were fed a corn-soybean meal diet (14% crude protein) that provided 50 mg/d niacin during gestation and 100 mg/d niacin during lactation (Table 1). Additional niacin was then added to provide sows with either 250/500 or 500/1000 mg/d niacin during gestation and lactation, respectively. All sows were fed 4 lb/d from breeding until d 90 of gestation, at which time feed was increased to 5 lb/d until farrowing. On day 108 of gestation, all sows were moved into the farrowing house, sow weight was recorded, and backfat was measured ultrasonically[1]. Following parturition, sows were fed 9 lb/d of a lactation diet.

**Table 1. Composition of Diets**

| Ingredients, % | Gestation I[a] | Gestation II[b] | Lactation[c] |
|---|---|---|---|
| Corn[d] | 80.45 | 86.17 | 75.48 |
| Soybean meal (44% CP) | 15.55 | 10.45 | 19.90 |
| Dicalcium phosphate (21% P) | 2.05 | 1.50 | 2.25 |
| Limestone | 1.10 | .95 | 1.25 |
| Salt | .50 | .45 | .50 |
| Vitamin premix[e] | .25 | .20 | .22 |
| Trace mineral premix[f] | .10 | .08 | .10 |
| Furox (50 g/lb) | -- | .20 | .20 |
| Biotin (100 mg/lb) | -- | -- | .10 |
| | 100.00 | 100.00 | 100.00 |

[a]Fed from d 0-90 of gestation at 4 lb/d providing 50 mg niacin/sow/d.
[b]Fed from d 90-114 of gestation at 5 lb/d providing 50 mg niacin/sow/d.
[c]Fed during lactation at 9 lb/d providing 100 mg niacin/sow/d.
[d]Corn was replaced by niacin to provide 250 or 500 mg niacin/sow/d during gestation, and 500 or 1000 mg niacin/sow/d during lactation.
[e]Each lb of premix contains the following: vitamin A, 800,000 IU; vitamin $D_3$, 60,000 IU; vitamin E, 4000 IU; riboflavin, 900 mg; menadione, 310 mg; pantothenic acid, 2400 mg; niacin, 5000 mg; choline chloride, 92,200 mg; vitamin $B_{12}$, 4.4 mg.
[f]Containing 10.0% Mn, 10% Fe, 1.0% Cu, 10% Zn, 0.30% I, and 0.3% Co.

Sow and pig weights were recorded within 24 h following parturition, and litter weights were recorded at weaning (d 21). Sow backfat was also measured at weaning.

Following weaning, sows were moved into individual gestation stalls and checked once daily for estrus with a boar. Estrous detection continued for a maximum of 30 d postweaning, at which time any sow not showing estrus was slaughtered, and her reproductive tract examined. For the second parity, sows were maintained on the same gestation-lactation treatments previously assigned, and all experimental procedures were similar to parity one.

[1]Technicare 210DX, Johnson & Johnson Co.

## Results and Discussion

The effects of niacin intake during gestation and lactation on sow and pig performance (parity 1) are reported in Table 2. Control sows (50/100 mg/d niacin gestation/lactation) had more total pigs born and more pigs born alive (quadratic, $P<.05$) than those fed 250/500 mg/d gestation/lactation, but were numerically similar to those fed the highest level of added niacin (500/1000 mg/d gestation/lactation). Number of pigs/litter after equalization was also decreased as the level of niacin increased (quadratic, $P<.05$). This trend was observed for the number of pigs weaned; number of pigs decreased then increased as dietary niacin level increased (quadratic, $P<.05$). This was a result of the improved pig survival from birth to weaning for pigs from sows fed additional niacin. Pig and litter birth weights were unaffected by dietary niacin intake; however, sows fed additional niacin weaned heavier pigs (quadratic, $P<.05$) and litters (quadratic, $P<.10$) than control sows.

Sow weight and backfat thickness changes during gestation were not affected by dietary treatment. Sows fed the 250/500 mg/d niacin gestation-lactation sequence had more backfat on d 108 of gestation than those fed the control or 500/1000 mg/d niacin gestation-lactation sequence (quadratic $P<.05$). However, sows fed 250/500 mg/d niacin also tended to lose more backfat but less body weight during lactation (quadratic $P<.05$). Because all sows had the same daily feed intake, this change in backfat during lactation might have been a result of greater milk production, as shown by the slightly heavier pig and litter wt at weaning.

During parity 2, there were no adverse affects of additional niacin on total number of pigs born or number born alive. In fact, number of pigs equalized/litter increased (quadratic $P<.05$) as niacin intake increased, opposite to the response observed in parity 1. In addition, pig birth wt, survival to weaning, and pigs weaned per litter were not affected by supplemental niacin. Additional niacin had no effect on sow weight or backfat changes during parity 2.

Research with dairy cattle has shown an increase in total milk yield and fat content for cows fed supplemental niacin. The exact metabolic process of how niacin improved milk yield is not known, but researchers feel that supplemental niacin may increase the level of NAD/NADP coenzymes, allowing for increased protein, carbohydrate, and lipid metabolism. Niacin may also increase milk production by elevating plasma glucose and preventing excessive fat mobilization (subclinical ketosis), thus allowing the liver to efficiently utilize normal plasma lipid levels.

From the wide range of niacin levels used in this study, it is difficult to determine the optimum level of additional niacin needed to maximize sow and litter performance. However, pig survival and pig and litter weaning weights appeared to be maximized for sows fed the 250/500 mg/d niacin level, which is higher than the 19 and 53 mg/d available niacin gestation/lactation sequence suggested by the 1989 National Research Council.

Table 2. **Effect of Niacin Intake during Gestation and Lactation on Sow and Litter Performance (Parity 1)[a]**

| Item | Niacin Intake mg, Gestation/Lactation | | |
|---|---|---|---|
| | 50/100 | 250/500 | 500/1000 |
| No. of litters | 40 | 38 | 43 |
| Total pigs born[b] | 10.30 | 9.18 | 10.16 |
| Pigs born alive | 9.35 | 8.85 | 9.51 |
| Pigs/litter after equalization[b] | 9.22 | 8.48 | 9.36 |
| Survival to weaning, %[c] | 89.18 | 94.10 | 92.37 |
| Pigs weaned/litter[b] | 8.20 | 7.95 | 8.65 |
| Pig Performance, lb | | | |
| Pig birth wt | 2.82 | 2.84 | 26.87 |
| Litter birth wt | 25.56 | 24.67 | 26.87 |
| Pig wt at weaning[b] | 11.00 | 11.98 | 11.43 |
| Litter wt at weaning | 90.80 | 94.61 | 97.89 |
| Sow wt gain during gestation, lb | 99.02 | 94.15 | 97.74 |
| Sow backfat change during gestation, in | -.01 | .02 | -.02 |
| Sow wt d 108 gestation, lb | 373.41 | 366.17 | 367.19 |
| Sow backfat d 108 gestation, in[b] | .98 | 1.05 | .96 |
| Sow wt loss during lactation, lb[b] | 24.54 | 18.32 | 24.44 |
| Sow backfat loss during lactation, in[b] | .15 | .19 | .15 |

[a]Lactation length, 21 d.
[b]Quadratic effect of niacin (P<.05).
[c]Quadratic effect of niacin (P<.10).

Table 3. **Effect of Niacin Intake during Gestation and Lactation on Sow and Litter Performance (Parity 2)[a]**

| Item | Niacin Intake mg, Gestation/Lactation | | |
|---|---|---|---|
| | 50/100 | 250/500 | 500/1000 |
| No. of litters | 27 | 25 | 28 |
| Total pigs born | 8.81 | 9.11 | 8.48 |
| Pigs born alive | 8.14 | 8.72 | 7.98 |
| Pigs/litter after equalization[b] | 7.94 | 8.48 | 7.64 |
| Survival to weaning, % | 97.66 | 95.45 | 98.66 |
| Pigs weaned/litter | 7.72 | 8.06 | 7.55 |
| Pig Performance, lb | | | |
| Pig birth wt | 3.27 | 3.26 | 3.32 |
| Litter birth wt | 26.19 | 28.13 | 25.57 |
| Pig wt at weaning | 12.37 | 12.43 | 12.83 |
| Litter wt at weaning | 95.39 | 99.20 | 95.59 |
| Sow wt gain during gestation, lb | 81.57 | 75.88 | 87.13 |
| Sow backfat change during gestation, in | .15 | .10 | .12 |
| Sow wt d 108 gestation, lb | 406.39 | 403.73 | 405.38 |
| Sow backfat d 108 gestation, in | .99 | .96 | .93 |
| Sow wt loss during lactation, lb | 21.91 | 20.08 | 23.21 |
| Sow backfat loss during lactation, in | .17 | .15 | .16 |

[a]Lactation length, 21 d.
[b]Quadratic effect of niacin (P<.05).