EFFECTS OF CHROMIUM PICOLINATE ON REPRODUCTION AND FARROWING PERFORMANCE OF PARITY ONE SOWS[1]

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Summary

We examined the influence of chromium picolinate fed to gilts during the growing phase from 50 lb through their first farrowing on reproductive and farrowing performance. No differences were detected in first service farrowing rate or total or live born litter size. These data fail to support a positive influence of chromium picolinate fed during development and gestation on reproductive and farrowing performance of parity 1 sows.

(Key Words: Sows, Chromium Picolinate, Litter Size, Gilt Development.)

Introduction

Chromium is a trace mineral normally thought to be present in adequate quantities in normal swine diets. However, recent research suggests that adding chromium to swine diets will lead to improved farrowing rates and increased litter sizes. Chromium also has been shown to influence the production of insulin, which is an important hormone that affects both growth and reproduction. Other research has indicated that dietary chromium supplementation will result in enhanced immune function. Several reports have indicated that chromium supplementation must occur for a fairly long period of time before the litter size increases are observed. The objective of this study was to examine the influence of chromium picolinate fed during development and gestation on reproductive and farrowing performance of parity 1 sows.

Procedures

Gilts were fed the standard diets for the farm or the standard diet supplemented with 200 ppb of chromium from chromium picolinate. These diets were corn and soybean meal-based; dietary specifications are listed in Table 1. Added trace minerals and vitamins were similar to KSU standard recommendations. The supplemental chromium was fed to gilts from 50 lb (placement in the finishing barn) through farrowing their first litter. During gilt development, every other room (600 hd per room) was fed supplemental chromium. Each room was filled approximately every 4 weeks. Gilts were transferred from the gilt multiplier to the commercial production sow farms in groups of approximately 25 per week. Gilts were moved to the commercial sow farm site (two 1,500-sow farms on the same site), held in an acclimation room, and heat checked daily. All gilts were bred by artificial insemination and were placed in gestation stalls immediately after breeding. They remained in the same stall until they were either detected open or moved to the farrowing house on d 112 of gestation.

During development and acclimation, the chromium-supplemented feed contained 200 ppb of chromium from chromium picolinate. Gilts were full-fed during development and

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acclimation. During gestation, all gilts receiving chromium were fed 1 tablespoon of a topdressing each day. It was formulated to provide 200 ppb for an ADFI of 5 lb. Gilts were fed according to body condition (4 to 6 lb) during gestation.

After each group of gilts was transferred, the gilts were assigned a unique alternate ID for each treatment, and all breeding and farrowing performance data were entered into a PigChamp database. The data then were extracted from the PigChamp and exported into a spreadsheet for analysis. All sows that did not conceive or farrow on the first service were assigned a removal reason of recycle and removed from the experiment.

Eight records were removed from the chromium-supplemented group that indicated a first service date but neither a farrowing date nor removal date. One record was removed because gestation length was less than 80 d and six records because the gestation length was greater than 140 d. Therefore, the conception probably was not the result of the recorded service. One duplicate record was removed that had the same entries for all variables, and one pair of duplicate records was removed because the alternate ID's were the same and the primary ID's were different. Nineteen of the control gilts were removed because service age and transfer ages were the same, indicating that transfer age was not accurate.

Transfer age, age at first service, gestation length, and total and live born litter sizes were analyzed as continuous variables with a general linear model that contained treatment, farm, and the interaction between farm and treatment. Culling rate before first service and first service farrowing rate were analyzed as categorical data using a chi square analysis. Gestation length was examined, because several farms in the system had clinical porcine respiratory reproductive syndrome (PRRS) outbreaks during the study period. One of the major signs of clinical PRRS is farrowing early, and chromium supplementation is not known to affect gestation length. Therefore, an effect on gestation would be supportive evidence of active clinical PRRS during the study period.

Table 1. Summary of Diet Specifications

Weight	Lysine, %	Added Fat, %	Lysine, g/ Mcal ME	Ca %	P %	Av. P%
16-26 lb	1.35	3	4.0	1.15	.95	.61
26-45 lb	1.30	3	3.9	.84	.80	.49
45-75 lb	1.20	0	3.7	.83	.79	.48
75-125 lb	1.10	0	3.3	.84	.71	.40
125-170 lb	1.00	0	2.9	.65	.61	.32
160-210 lb	.85	0	2.3	.63	.59	.31
210 lb -Transfer	.75	0	2.0	.62	.57	.31
Acclimation	.70	0	--	1.05	.96	.53
Gestation	.70	0	--	1.05	.96	.53
Lactation	1.30	5	--	1.08	.90	.49

Results and Discussion

Listed in Table 2 are the frequencies of sows used in the analysis for each event by treatment. Note that because gilt deliveries by treatment overlapped before a chromium-supplemented room was empty, some of the control gilts were fed chromium-supplemented feed. These pigs were taken off test. This resulted in approximately 50% fewer control animals compared to chromium-supplemented gilts.

The sow performance data are listed in Table 3. Note that an interaction (P<.04) between farm and treatment occurred for transfer age. Control gilts averaged 2.2 d older at transfer. The distribution for the control gilts is slightly skewed to the right. Further examination of the distributions by farm and treatment indicates that the interaction was due to a greater number of control gilts having a transfer age of more than 200 days in one farm. This difference was not observed in gilts fed chromium. This interaction probably was due to management decisions regarding the flow of gilts into the sow farm sites rather than dietary treatment.

The interaction between treatment and farm was not significant (P>.20) for age at first service. The mean age at first service was 9.3 days older (P<.01) for the chromium-supplemented gilts than for the control gilts. The age at first service was skewed to the right with a significant proportion of the gilts being greater than 300 d of age at first service. Very few of the control gilts had a first service age of greater than 300 d of age at either farm. Therefore, the mean difference was due to the skewing of the distribution of ages rather than the shifting of age at first service for all gilts. The greater number of gilts more than 300 d of age fed chromium could be due to one of three reasons: a management decision to voluntarily delay insemination of gilts at a greater rate for the chromium-supplemented gilts, failure to detect and inseminate gilts at a greater rate for the gilts fed chromium, or a biological effect of chromium supplementation. The interaction between dietary treatment and farm was significant (P<.04) for farrowing age. Although the interaction is significant, in contrast to age at first service, the distributions are generally similarly shaped.

The percentage of culls before first service was not different between treatments nor was first-service farrowing rate. However, the chromium-supplemented gilts had a numerically lower (5.2%) farrowing rate. No differences in gestation length occurred between chromium-supplemented and control sows. The distribution of gestation length appears to be normal for both treatments. This indicates that PRRS probably was not active during the study period.

Differences in total and live pigs born were not detected between chromium-supplemented and control gilts. In summary, this experiment failed to indicate a positive influence of chromium picolinate fed during development and gestation on reproductive and farrowing performance of parity 1 sows.

Table 2. Numbers of Sows by Event

	Treatment	
No. of Sows	Chromium	Control
Transferred	343	154
Culls before 1st service	14	6
First service	329	148
Farrowing	245	118

Table 3. Effect of Chromium Picolinate on Sow Performance

Item	Treatment: Chromium	Treatment: Control	P-Value
Age, d			
Transfer[a]	178.7 ± .5	180.9 ± .7	-
First service[b]	235.1 ± 1.8	226.4 ± 2.7	.01
Farrowing[a]	348.2 ± 1.9	341.4 ± 2.8	-
Percentage			
Culls before 1st service	4.1	3.9	.97
1st service farrow rate	74.5	79.7	.21
Gestation length, d[b]	116.0 ± .1	116.1 ± .1	.88
Litter Size, no. of pigs			
Total born	10.8 ± .2	10.7 ± .3	.71
Live born	9.6 ± .2	9.5 ± .3	.78

[a]Transfer age and farrowing age by farm interaction (P<.04).

[b]First service age and gestation length by farm interaction (P>20).