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One-day supplementation with tyrosine did not affect reproductive traits of sows

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ONE-DAY SUPPLEMENTATION WITH TYROSINE DID NOT AFFECT REPRODUCTIVE TRAITS OF SOWS[1]

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Summary

Primiparous and multiparous sows received a single dietary supplement of L-tyrosine in their feed on the day after weaning, and the effects on various reproductive traits were evaluated. Sows received either none (control; n = 21) or 45.5 mg L-tyrosine/lb BW (tyrosine; n = 22) on the day after weaning. In Exp. 1, days from weaning to estrus (5.1 ± 1 vs 5.3 ± .9 d) and ovulation rate (number of corpora lutea on ovaries on d 5 after estrus) (16.3 ± 4.4 vs 16.2 ± 4) were similar in control and tyrosine-supplemented sows. In Exp. 2, (control; n = 63; tyrosine; n = 53) days to estrus were extended by tyrosine supplementation (6.4 ± .5 d) compared to control sows (4.6 ± .5 d), but total numbers of piglets born (10.6 ± .4 vs 10.1 ± .4) were similar in control- and tyrosine-treated groups. Therefore, a single dietary supplementation with tyrosine on the day after weaning failed to influence interval to estrus, ovulation rate, or litter traits.

(Key Words: Tyrosine, Sows, Weaning, Estrus, Litter Size.)

Introduction

The amino acid L-tyrosine is the substrate for the synthesis of various catecholamines (e.g., dopamine, norepinephrine, epinephrine) in the brain. Uptake of L-tyrosine from the blood plasma across the blood-brain barrier depends on the concentration of L-tyrosine relative to the concentrations of the other members of the family of large neutral amino acids (i.e., tryptophan, phenylalanine, valine, leucine, and isoleucine), all of which compete for a common membrane-bound transport mechanism. Research has indicated that brain functions are modified by altering the supply of amino acids that serve as precursors for the synthesis of neurotransmitters.

A number of German studies have demonstrated profertility effects of a dietary supplementation with L-tyrosine in several species, when L-tyrosine was fed near the onset of estrus. According to recent work at the University of Minnesota, the concentrations of L-tyrosine in plasma of sows were lowest at the time of the first estrus following weaning. Therefore, our objective was to determine the effect of a single dietary supplement of L-tyrosine given the day after weaning on reproductive performance in sows.

Procedures

Two experiments involving primiparous and multiparous sows were conducted at two locations in Kansas. Sows received either none or 45.5 mg/lb BW of L-tyrosine (Lonza Inc., Fairlawn, NJ) as a single dose, mixed in their regular diet 24 h after litters were weaned. Detection of estrus and breeding were done by the respective herd personnel, and interval to estrus was defined as the time from weaning until the first observed standing estrus.

[1]The authors thank Henry's LTD, Longford, KS, for asistance in data collection and use of animals and facilities in Exp. 2.

Experiment 1 was conducted at the Kansas State Swine Teaching and Research Unit with sows assigned randomly to receive L-tyrosine (tyrosine; n = 22) or to serve as non-supplemented controls (control; n = 21). On d 5 after standing estrus, laparotomy was performed and number of corpora lutea were counted in a subset of sows.

Exp. 2 was conducted in cooperation with a Kansas swine producer. Crossbred sows were assigned randomly to treatments (control; n = 61; tyrosine; n = 53). Data collected were interval to estrus, length of gestation, number of pigs born alive, mummified pigs, stillborn pigs, total number of pigs born, week of weaning, body condition score of the sows at weaning, and parity.

Results and Discussion

A summary of results from Exp. 1 is in Table 1. Average interval to estrus after weaning was unaffected by supplementation with tyrosine, and number of corpora lutea (ovulation rate) were similar in control and tyrosine-supplemented sows.

In Exp. 2, interval to estrus was 1.8 d longer ($P < .01$) in tyrosine-supplemented sows than in control sows, but subsequent litter traits of sows that conceived at the first postweaning estrus were similar (Table 2).

Under the circumstances of our experiments, L-tyrosine may not have been rate-limiting in the synthesis of catecholamines at the time of treatment. Swine diets in Germany are based on wheat and barley compared to corn and milo-based diets in the U.S. and that could explain the different results in our studies and those conducted in Germany.

In conclusion, supplementing sows with L-tyrosine on the day after weaning failed to shorten the interval from weaning to estrus or to increase ovulation rate and subsequent litter traits of sows.

Table 1. Experiment 1. Days from Weaning to Estrus and Number of Corpora Lutea in Primiparous (n = 35) and Multiparous (n = 10) Sows Supplemented with L-tyrosine (0 or 45.5 mg/lb BW) on the Day After Weaning

Treatment	Days to estrus[a]	No. of corpora lutea[b]
Control	5.1 ± 1 (n = 22)	16.2 ± .9 (n = 19)
Tyrosine	5.3 ± .9 (n = 23)	15.8 ± .9 (n = 15)

[a]Interval from weaning to first observed estrus.
[b]Number of corpora lutea were determined by laparotomy on d 5 after first detected estrus.

Table 2. Experiment 2. Days from Weaning to Estrus and Litter Traits of Sows Supplemented with L-tyrosine (0 or 45.5 mg/lb BW) on the Day After Weaning[a]

Item	Control	Tyrosine	SEM	P value
No. sows	61	53		
Weaning to estrus, d	4.6	6.4	.5	.01
Gestation length, d	114.2	114.2	.2	.94
No. pigs born alive	9.9	9.3	.4	.27
No. mummies	.08	.14	.05	.36
No. stillborn pigs	.56	.69	.14	.52
Total pigs born	10.6	10.1	.4	.47

[a]Body condition score and weaning date were nonsignificant covariables in these analyses.