Swine

Controlled Feeding Regime for Maximum Litter Size

Charles V. Maxwell, Rick D. Jones and Rex Vencl

Story in Brief

The effects of high feed intake in early gestation on reproductive performance was studied in 4 trials involving 147 crossbred gilts of Duroc, Hampshire and Yorkshire breeding. Four dietary treatments were devised to determine the time after ovulation at which mortality of fertilized ova occurs when gilts are fed a high feed intake.

Feeding large amounts of feed (10 pounds per day) during day 1 and 2 or during the entire 25 days following breeding resulted in a reduction in the number of embryos that survived to 32 days of gestation when compared to low levels of feed (4 pounds per day). However, when 10 pounds of feed was fed from day 3 through day 10, embryo survival was not affected. This suggests that the detrimental effect of high feed intake on embryo survival occurs during days 1 and 2 of gestation. This study indicated that the proper timing of high feed intake in gilts during and following the breeding period is absolutely essential for maximum litter size. To deviate from the controlled feeding program by as little as 2 days may result in reduced embryo survival.

Introduction

Litter size may be reduced by as much as 30 to 50% from the time of fertilization until farrowing when sows are fed and managed under conventional schemes. Approximately two-thirds of the total embryonic death occurs before day 25 of pregnancy. Specific controlled feeding regimes have been shown to increase potential litter size by increasing ovulation rate and decreasing embryo death. A system of high feed intake prior to breeding followed by low intake following breeding in gilts has consistently resulted in an increased number of embryos at 25 days of gestation. However, experiments have not been conducted to identify when high energy intake causes embryonic mortality during early gestation.

This study was initiated to investigate the effects of high feed intake at specific time periods following breeding on reproductive performance.

Experimental Procedure

A total of 4 replicates involving 147 crossbred gilts was used in this study. The gilts were maintained in dirt lots and fed in individual feeding stalls. A corn-soybean meat diet calculated to contain 14.75 percent crude protein and 1460 Kcal of digestible energy per pound (Table 1) was fed at the rate of 5 pounds per head per day from the time gilts were approximately 7 months old until 7 days after the first observed estrus. Then gilts were flushed by feeding the same ration at the rate of 10 pounds daily until the second breeding, at the following estrus. Twice daily feeding was used to obtain the desired feed intake. The gilts were checked twice daily for estrus using a teaser boar. Gilts were bred naturally to purebred Yorkshire boars at approximately 12 hours after the gilts were observed to be in standing heat. This was followed by a second mating to a different boar approximately 12 hours later.

Following the second mating (24 hours after the start of estrus) the gilts were randomly allotted to one of four different feeding regimes. The treatments following breeding were as follows:

Treatment 1. Control—Fed 4 pounds per day, day 1 through day 25.

Treatment 2. Fed 10 pounds on day 1 and 2 and 4 pounds on day 3 through day 25.

Treatment 3. Fed 4 pounds on day 1 and 2, 10 pounds on day 3 through day 10 and 4 pounds on day 11 through day 25.

Treatment 4. Fed 10 pounds per day, day 1 through day 25.

Table 1. Composition of Ration.

Ingredients, %	
Yellow Corn	72.00
Soybean meal, 44%	16.70
Alfalfa meal, 17%	4.82
Cane molasses (wet)	2.90
Dicalcium phosphate	1.55
Calcium carbonate	0.85
Vitamin trace mineral mix[1]	0.50
Salt	0.50
Aureomycin 50	0.18
TOTAL	100.00
Protein, %	14.75
Digestible Energy, Kcal/lb.	1460
Calcium, %	0.75
Phosphorus, %	0.60

[1] Supplied 3,000,000 I.U. vitamin A; 300,000 I.U. vitamin D; 4 gm riboflavin; 20 gm pantothenic acid; 30 gm niacin; 1,000 gm choline chloride; 15 mg vitamin B_{12}; 6,000 I.U. vitamin E, 20 gm menadione; 0.2 gm iodine; 90 gm iron; 20 gm manganese; 10 gm copper and 90 gm zinc per ton of feed.

All gilts were fed at the rate of 5.0 lb. per head daily after day 25 and slaughtered at 28 to 32 days after breeding. Reproductive tracts were removed and examined for number and condition of embryos. Weight gain of the gilts and conception rate were determined.

Results and Discussion

The effect of postbreeding feed intake on weight gain and conception rate are shown in Table 2. Mean breeding weight for gilts on each treatment ranged from 288 to 306 lb. Breeding weight for gilts on treatment 2 was lower than for gilts on treatments 3 and 4. Initial weight could be an important factor since it affects ovulation rate. However, since number of embryos was adjusted for differences in ovulation rate, no further adjustments for initial weight were made.

As expected, gilts fed the high feed intake for the entire 25 days after breeding gained more weight than gilts fed at lower total intake levels (treatment 4 was higher than treatments 1, 2 or 3). Although no significant differences in conception rate were observed, it should be noted that conception rate appeared to be considerably reduced in gilts fed a high energy intake throughout the 25 day feeding period (treatment 4). Since conception rate was not reduced in treatment 2 or 3, it would appear that high feed intake through at least the first 10 days following breeding is not detrimental to maximum conception rate.

The effect of feed intake following breeding on reproductive performance is shown in Table 3. The total number of embryos at 32 days of pregnancy was greatest in gilts fed the low energy intakes for the entire 25 day period (treatment 1) and in gilts fed the low feed intake except during days 3 through 10 after breeding (treatment 3). Feeding a high level of feed intake on day 1 and 2 (treatment 2) decreased the total number of embryos when compared to treatment 1 (decrease of 1.7 embryos) or treatment 3 (decrease of 2.2 embryos). Feeding high intake for the entire 25 day period (treatment 4) decreased total number of embryos when compared to treatment 1 (decrease of 1.3 embryos) or treatment 3 (decrease of 1.8 embryos).

Table 2. The Effect of Postbreeding Feed Intake on Weight Gain and Conception Rate.

	Treatments			
	1	2	3	4
No. Gilts	40	37	33	37
Breeding Weight, lb.	297	288	306	306
Weight Gain, lb.	31.6	34.5	30.4	48.8
Conception Rate, %	87.5	94.5	87.9	75.7

Table 3. The Effect of Increased Postbreeding Feed Intake on Reproductive Performance of Gilts.

	Treatments			
	1	2	3	4
No. Gilts	35	35	29	28
No. Corpora Lutea	16.0	15.2	16.2	15.6
No. Embryo	13.8	12.1	14.3	12.5
No. Embryo, adj.	13.7	12.4	14.1	12.7
Embryo Survival, %	85.7	79.9	88.0	80.3

Adjusting number of embryos for equal number of corpora lutea for all gilts did not alter the response or the magnitude of response to any of the treatments. Number of embryos were still higher in treatments 1 and 3 than 2 and 4. There was no difference in number of embryos present in gilts fed the high intake for the entire 25 days as compared to those fed the high intake for only day 1 and day 2 of the period. Feeding a high intake from day 3 through 10 (treatment 3) did not decrease the number of embryos. Thus, this data suggest that the loss of embryos associated with high feed intake occurred during the first two days following breeding. .

The number of corpora lutea (CL) on the ovaries is an indication of the total number of ova produced at ovulation. Thus embryo survival (the number of embryos divided by the number of CL's) gives a method to estimate the percentage of the ova ovulated that become fertilized and develop until day 32 of pregnancy. As presented in Table 3, embryo survival for treatment 3 (high feed intake on day 3 through 10) was higher than treatment 2 (high feed intake on days 1 and 2) and treatment 4 (high feed intake for the entire 25 days).

Embryo survival data in this experiment supports the same general concept that the major loss of embryo due to high feed intake occurred during days 1 and 2 following breeding. This suggests that if swine producers are attempting to increase litter size in gilts by increasing feed intake prior to breeding, they must reduce the feed intake immediately after breeding. Thus, the potential increased litter size of 1.5 to 2 pigs per litter can only be accomplished by the use of a well controlled feeding system. It should also be noted that the above results are with gilts. Available research information suggests that sows do not respond as well as gilts to a controlled feeding program such as the one used in this experiment.