FACTORS AFFECTING REBREEDING PERFORMANCE OF WEANED SOWS

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Approximately 100 weaned sows were used to study factors that might alter rebreeding of sows. Days required to return to estrus did not affect reproductive measures. Number of times mated also was not found to alter reproductive rates. Certain boars were found to influence litter size.

Rebreeding performance encompasses the following events in the sow: ovulation rate, number of normal embryos in the uterus 25 days post-breeding, per cent embryo survival, number of pigs born and number of pigs born alive at the subsequent parturition. Numerous factors influence the weaned sow's rebreeding ability and performance. The following factors have been examined in research trials at the North Dakota State University Hog Farm: number of days to return to estrus after weaning, number of breedings, boar fertility, number of corpora lutea, number of normal embryos and number of pigs born. By evaluating what effect these factors have on rebreeding performance, hog producers could acquire a more comprehensive understanding of swine reproduction.

PROCEDURE

Four trials involving approximately 100 sows were conducted over a period of 1.5 years. Lactating Duroc sows were weaned after an average lactation length of 27 days. Piglets were fostered to various litters to maintain an average of eight nursing piglets per sow.

During lactation, gilts were fed at a rate of 1.8 kg feed (15% crude protein) plus 0.45 kg per nursing pig per day. One-half of the ration was fed in the morning and one-half was fed in the evening. After weaning, sows were fed 2.3 kg feed (16% crude protein) per day.

Following weaning the sows were checked for estrual activity twice daily (0800 and 2000 hours) and were bred by Duroc boars after the onset of estrus. Sows were mated two, three or four times to the same boar. After mating, one-half of each treatment group was randomly designated for slaughter at 25 days' post-breeding. The remaining one-half were allowed to complete gestation and farrow.

At slaughter the following data were collected: number of corpora lutea present on the ovaries and number of normal, viable embryos. Corpora lutea present on the ovaries were assumed to represent the number of ova shed at estrus. Normal embryos were characterized by an embryo with the presence of a heartbeat and being of a size comparable to its contemporaries. Per cent embryo survival was defined as the number of normal embryos present per 100 corpora lutea. Farrowing data included number of pigs born and number of pigs born alive.

RESULTS AND DISCUSSION

Return to Estrus

The number of days taken to return to estrus after weaning did not significantly influence number of corpora lutea, number of normal embryos or per cent embryo survival at 25 days of gestation (Table 1). It may be speculated that sows returning to estrus in a shorter interval than other sows may have a more functional pituitary, an ability to release greater amounts of gonadotropins, or more responsive ovaries. Aherne *et al.*, (1976) have examined gonadotropin levels in the weaned sow. Mean FSH plasma concentrations were highest on the day of weaning and the first day after weaning. Mean LH concentrations were low at weaning but increased abruptly on the day prior to estrus. Withholding feed and water for 24 hours after weaning had no significant influence on gonadotropin levels.

The number of pigs born and the number of pigs born alive were not significantly affected by the length of time required by the sow to return to estrus (Table 2).

Seventy-eight per cent of the sows (76 of 98) returned to estrus in six days or less. By 12 days after weaning 93 per cent of the sows (91 of 98) had returned to estrus. It is the producer's goal to have sows return to estrus in a short and concentrated interval after weaning. This results in a minimum rebreeding time and ensures that the farrowing interval (time between consecutive parturitions) of the sow are as short as possible. This allows for maximum productivity from each sow, providing boar power during rebreeding is adequate.

Number of Breedings

As stated in the experimental procedure, sows were mated during the first estrus following weaning. Because of extended estrus periods or management reasons, sows were sometimes mated more than two times. The times of matings in this study were 12, 23, 36 and 48 hours after the onset of estrus. The effect number of breedings had on number of corpora lutea, normal embryos and per cent embryo survival at day 25 of gestation is shown in Table 3. Number of breedings did not significantly

influence any of the previously mentioned parameters. Number of breedings also had no significant effect on number of pigs born or number of pigs born alive (Table 4). From the data obtained, it would appear that there was no advantage to breeding sows more than two times during estrus. Signoret *et al.*, (1972) examined the effect mating had on the onset and duration of ovulation in the sow. He concluded that mating hastens the onset of ovulation by four hours and shortens the duration by 2.8 hours. Zimmerman (1971) also has reported studies with similar results.

Boars

There were no significant effects of boars on number of corpora lutea, number of normal embryos and per cent embryo survival at 25 days of gestation (Table 5). This indicates that the boars used in the present study did not statistically alter data obtained at slaughter. Swierstra and Dyck (1976) have indicated that boars can influence embryonic survival, with ranges of embryo survival from 24 to 84 per cent for various boars. Boars had a significant ($P < .025$) influence on number of pigs born and number of pigs born alive (Table 6). Studies by Swierstra and Dyck have also shown that boars can influence number of pigs born and number of pigs born alive. In the present study, boars were mated an equal number of times to sows in each treatment group. In this way, although boars can influence number of pigs born and number of pigs born alive, they will affect each treatment group equally and therefore not alter the statistical analysis.

Corpora Lutea

The number of corpora lutea and its effect on number of normal embryos and per cent embryo survival are shown in Table 7. As number of corpora lutea increase, from 8 to 19, number of normal embryos increase also. This was expected because corpora lutea represent the number of ova ovulated and fertilization rates in swine approach 100 per cent. Per cent embryo survival was not altered significantly by number of corpora lutea. Martin *et al.*, (1977) have shown that if the number of corpora lutea is less than five, abortion will occur.

Normal Embryos

The effect of number of normal embryos at day 25 of gestation on per cent embryo survival is shown in Table 8. Embryo survival increases as number of normal embryos increases up to 14 normal embryos, at which point survival appears to plateau. It may be that any more than 14 normal embryos causes a crowding situation for the embryos. Dzuik (1968) has stated that crowding is not a factor until after day 25 of gestation. Another explanation for increased survival as embryo numbers increase was that embryos may have a complementary relationship with each other, i.e., one embryo improves the survival chances of other embryos. When the number of embryos was three or less, embryo survival was severely depressed. This phenomenon may be the result of the uterus not recognizing the pregnancy with so few embryos present.

Pigs Born

As the number of pigs born increases the number of pigs born alive also increases (Table 9). There appears to be no detrimental effect of increased pig numbers on the survival of the pig during parturition. It may be speculated that when large numbers of pigs are born, a detrimental effect may be seen due to the extended time to complete parturition.

SUMMARY

Four trials utilizing approximately 100 weaned sows were conducted to determine if the interval of return to cyclic activity, number of breedings, boars, corpora lutea, normal embryos and number of pigs born would influence rebreeding performance.

Days to return to estrus after weaning had no significant influence on number of corpora lutea, number of normal embryos and per cent embryo survival. Number of pigs born and number of pigs born alive also were not affected by the number of days taken to return to estrus. The number of breedings did not significantly alter any of the variables measured. Therefore, there is no advantage to mating sows more than two times during estrus.

In the present study, the boar was found to have a significant ($P < .025$) influence on the number of pigs born and number of pigs born alive. Hog producers should keep accurate records so that boars with low fertility rates may be culled.

In conclusion, the hog producer who has a basic understanding of swine reproduction will find himself better prepared to meet the challenges of swine production. tion.

TABLE 1. CORPORA LUTEA, NORMAL EMBRYOS AND PER CENT EMBRYO SURVIVAL AS INFLUENCED BY DAYS TO RETURN TO ESTRUS

Days to Return	N	Number of Corpora Lutea ± SEM	Number of Normal Embryos ± SEM	Embryo Survival (Per cent) ± SEM
1 — 6	45/42/42	13.5 ± 0.8	10.4 ± 0.7	77.2 ± 4.5
7 — 12	08/07/07	13.5 ± 0.9	10.6 ± 1.0	78.0 ± 13.0
13 — 20	04/04/04	15.8 ± 0.9	11.8 ± 1.8	73.4 ± 8.0

N = Number of sows contributing data. N/N/N/ refers to variables named, respectively.
SEM = Standard error of the mean.

TABLE 2. PIGS BORN AND PIGS BORN ALIVE AS AFFECTED BY DAYS TO RETURN TO ESTRUS

Days to Return	N	Number of Pigs Born	Number of Pigs Born Alive	SEM
1 — 6	12	10.2	9.5	0.6
7 — 12	7	9.7	9.7	1.1
13 — 20	3	10.0	9.7	1.8

TABLE 3. CORPORA LUTEA, NORMAL EMBRYOS AND PER CENT EMBRYO SURVIVAL AS INFLUENCED BY NUMBER OF BREEDINGS

Number of Breedings	N	Number of Corpora Lutea ± SEM	Number of Normal Embryos ± SEM	Embryo Survival (Per cent) ± SEM
1	01/01/01	17.0 ± 0.0	9.0 ± 0.0	53.0 ± 0.0
2	28/26/26	13.4 ± 0.4	10.3 ± 0.6	77.3 ± 3.7
3	16/15/15	14.1 ± 0.7	10.9 ± 0.8	77.8 ± 4.6
4	10/09/09	13.2 ± 0.8	10.4 ± 0.9	76.6 ± 4.1
5	01/01/01	14.0 ± 0.0	13.0 ± 0.0	92.9 ± 0.0
6	01/01/01	16.0 ± 0.0	11.0 ± 0.0	68.8 ± 0.0

TABLE 4. PIGS BORN AND PIGS BORN ALIVE AS AFFECTED BY NUMBER OF BREEDINGS

Number of Breedings	N	Number of Pigs Born	Number of Pigs Born Alive	SEM
2	14	10.2	9.6	0.8
3	7	9.3	9.1	1.0
4	1	12.0	9.0	0.0

TABLE 5. CORPORA LUTEA, NORMAL EMBRYOS AND PER CENT EMBRYO SURVIVAL AS INFLUENCED BY BOAR

Boar	N	Number of Corpora Lutea ± SEM	Number of Normal Embryos ± SEM	Embryo Survival (Per cent) ± SEM
D4-1	04/04/04	13.0 ± 0.4	10.3 ± 0.6	78.9 ± 4.6
D14-2	13/13/13	13.9 ± 0.9	10.7 ± 0.8	77.8 ± 6.0
D97-12	12/12/12	14.1 ± 0.7	10.3 ± 1.1	73.3 ± 6.5
D98-1	07/06/06	14.4 ± 0.9	11.0 ± 1.4	74.6 ± 7.0
D98-6	15/13/13	13.1 ± 0.8	10.8 ± 5.6	82.6 ± 5.6
D111-7	05/04/04	13.2 ± 0.4	10.0 ± 1.4	74.6 ± 8.5

TABLE 6. PIGS BORN AND PIGS BORN ALIVE AS AFFECTED BY BOAR

Boar	N	Number of Pigs Born	Number of Pigs Born Alive	SEM
D111-7	4	7.0*ab*	7.0*ab*	0.4
D14-2	1	6.0	6.0	0.0
D97-12	5	11.8*a*	10.6*a*	1.0
D98-1	4	9.8	9.3	1.2
D98-6	8	11.0*b*	10.9*b*	0.9

a,b Means with the same superscipt differ at P < .025.

TABLE 7. NORMAL EMBRYOS AND PER CENT EMBRYO SURVIVAL AS AFFECTED BY CORPORA LUTEA

Number of Corpora Lutea	N	Number of Normal Embryos ± SEM	Embryo Survival (Per Cent) ± SEM
8	1	8.0 ± 0.0	100.0 ± 0.0
9	1	6.0 ± 0.0	66.7 ± 0.0
10	3	9.0 ± 0.6	90.0 ± 5.8
11	4	9.0 ± 0.0	81.8 ± 0.0
12	6	8.8 ± 0.7	73.6 ± 5.9
13	10	10.3 ± 0.5	79.2 ± 4.1
14	12	10.9 ± 0.9	78.0 ± 6.4
15	1	14.0 ± 0.0	93.3 ± 0.0
16	7	10.9 ± 1.5	67.9 ± 9.2
17	4	11.5 ± 1.7	67.7 ± 9.7
18	2	13.5 ± 1.5	75.0 ± 8.3
19	2	15.0 ± 0.0	78.9 ± 0.0

TABLE 8. PER CENT EMBRYO SURVIVAL AS AFFECTED BY NORMAL EMBRYOS

Number of Normal Embryos	N	Embryo Survival (Per Cent) ± SEM
2	1	14.3 ± 0.0
3	1	25.0 ± 0.0
6	2	58.4 ± 8.4
7	1	53.8 ± 0.0
8	4	74.2 ± 10.6
9	11	73.8 ± 3.6
10	7	78.8 ± 3.9
11	7	80.2 ± 3.3
12	8	81.0 ± 3.2
13	3	95.3 ± 2.4
14	2	96.7 ± 3.4
15	5	85.7 ± 3.4
16	1	94.1 ± 0.0

TABLE 9. PIGS BORN ALIVE AS AFFECTED BY PIGS BORN

Number of Pigs Born	N	Number of Pigs Born Alive ± SEM
6	2	6.0 ± 0.0
7	4	7.0 ± 0.0
8	2	8.0 ± 0.0
9	1	8.0 ± 0.0
10	3	8.7 ± 0.9
11	3	11.0 ± 0.0
12	2	10.5 ± 1.5
13	3	12.7 ± 0.3
14	1	14.0 ± 0.0
15	1	15.0 ± 0.0

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