between the size of litter she was weaned in was zero or positive regardless of the breeding of the embryo. The size of litter born in was associated with less than 25 percent of the variation in size of litter weaned in. This may indicate that the competition in large litters while the pigs are highly dependent on the sow for nutrition may adversely affect later reproductive efficiency. However by 42 days, the pigs consume enough creep feed so that the competition in large litters has little or no effect on subsequent reproductive efficiency.

Although all correlations reported are small, some consistent patterns are evident. It appears that gilts that are heavier than average at weaning and that grow faster from weaning to 220 lbs. can be expected to have somewhat higher ovulation rates and more embryos than smaller, slower growing gilts. The size of litter which a gilt is born in or raised in appears to have little relationship to her future productivity. These data also suggest that on the average gilts that are heavier at breeding can be expected to have higher ovulation rates and more embryos than lighter gilts at breeding.

The Influence of Prostaglandin $F_{2\alpha}$ on Estrous Cycle Length and the Induction of Parturition in Swine

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Story in Brief

Twenty 9-month-old crossbred gilts were randomly allotted to one of four treatment groups to determine the effects of prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) on estrous cycle length. Two groups were injected four times intramuscularly at 12 hour intervals starting on day 4 of the estrous cycle with either a total of 80 mg $PGF_{2\alpha}$ or sterile saline. The other two

groups were treated similarly except treatments were started on day 12 of the estrous cycle. Estrous cycle length was not altered by $PGF_{2\alpha}$ treatment starting on day 4. However, when treatment was initiated on day 12, the treated gilts had a cycle length of 17.2 days; whereas, the cycle length of control gilts was 18.6 days ($P<.10$).

In the second trial, two groups of six gilts each were given a single injection of either 10 mg $PGF_{2\alpha}$ or saline on day 108 of gestation. Animals treated with $PGF_{2\alpha}$ showed signs of milk letdown about one day after injection. Control gilts, on the other hand, did not begin their milk letdowns until approximately four days after injection of saline. Farrowing began in the treated gilts about 33.3 hours after administration of $PGF_{2\alpha}$, while the control animals began farrowing about 104.7 hours after saline injection.

The dose and time of treatment with $PGF_{2\alpha}$ used in this study shortened estrous cycle length in gilts but not enough to make it useful for estrous synchronization. The treatments used during later pregnancy shortened the length of gestation and caused farrowing to occur within a short interval of time.

Introduction

Estrous synchronization is necessary for efficient use of artificial insemination in swine. Normally, much time is required to determine when gilts and sows are in standing heat before inseminations can be made. Another time period requiring much labor is during farrowing. Frequent observation of sows, and assistance near the time of farrowing, helps to increase the number of live pigs born. Treatments or management practices that might reduce the labor requirements at these times would be very helpful.

Several researchers have studied the effect of prostaglandins on estrous cycle length in farm animals. These hormones, produced by most tissues in the body especially the uterus and the placenta, have been effective in causing regression of the corpus luteum in sheep and cattle, but regression of the corpus luteum of the pig by prostaglandins has not been reported. Corpora lutea serve to regulate estrous cycle length in animals and also to maintain a proper uterine environment for both implantation and pregnancy. If the corpora lutea could be removed at a desired time, animals would come into estrus in a short time interval; or pregnancy could be terminated and farrowing induced within a short time period.

For these reasons, two trials were initiated at Oklahoma State in the summer of 1973 to examine the effects of $PGF_{2\alpha}$ on estrous cycle length and farrowing in gilts.

Materials and Methods

In the first trial, 20 nine-month-old crossbred (Yorkshire x Hampshire) gilts were randomly assigned to one of four treatment groups after each animal had exhibited at least one normal estrous cycle. Gilts were checked twice daily for signs of estrus using a boar. The first day of standing estrus was denoted as day 0. Ten gilts were injected four times intramuscularly at 12 hour intervals starting on day 4 of the estrous cycle. Five of these gilts were given sterile saline and the other five were given 20 mg $PGF_{2\alpha}$[1] per injection. The remaining 10 gilts were treated similarly except treatments were initiated on day 12 of the estrous cycle with five animals receiving $PGF_{2\alpha}$. Gilts were bred to two different boars on the first and second days of heat after treatment.

In the second trial, 12 pregnant gilts were placed in farrowing crates on day 108 of gestation. Six gilts were given a single intramuscular injection of saline and six were given 10 mg of $PGF_{2\alpha}$. Day 108 was chosen as the treatment day so the effects of the hormone could be examined without having to contend with the problem of normal early farrowing in gilts. The gilts were observed regularly after treatment so that the actual time of farrowing could be determined.

Results

Estrous Cycle Length

Gilts treated on days 4 and 5 of the estrous cycle with $PGF_{2\alpha}$ had cycle lengths similar to control gilts (19.0 *vs.* 20.2 days, respectively). The length of the cycle after the gilts were treated on days 4 and 5 was also similar to their cycle length prior to treatment (Table 1).

[1] Supplied by The Upjohn Co., Kalamazoo, Michigan.

Table 1. Estrous Cycle Length (Days) of Gilts Treated with $PGF_{2\alpha}$ or Sterile Saline

Treatment	No. gilts	Pre-treatment cycle length	Treatment cycle length
$PGF_{2\alpha}$ (days 4, 5)	5	19.4	19.0
Saline (days 4, 5)	5	19.4	20.2
$PGF_{2\alpha}$ (days 12, 13)	5	18.8[1]	17.2[1,2]
Saline (days 12, 13)	5	19.6	18.6[2]

[1] Values are significantly different ($P \leq .01$).
[2] Values are significantly different ($P \leq .10$).

Treatment of gilts with $PGF_{2\alpha}$ on days 12 and 13 of the estrous cycle reduced the cycle length to 17.2 days as compared to 18.6 days ($P<.10$) for controls. The length of the cycle after $PGF_{2\alpha}$ given on days 12 and 13 was also shorter than the cycle prior to treatment (18.8 days) in the same gilts ($P<.01$). Four of the five gilts treated with $PGF_{2\alpha}$ on days 12 and 13 of the cycle were in heat on the fourth day after the last treatment and the other gilt was in heat on the fifth day post treatment.

These results indicate that $PGF_{2\alpha}$ given early in the cycle does not stop luteal growth and bring gilts into estrus early. However, when $PGF_{2\alpha}$ is given on days 12 and 13 of the cycle, luteal regression does occur.

Conception Rate After Prostaglandin

The conception rate of gilts bred on the first and second days of estrus after treatment are listed in Table 2. Although these data are very limited, they indicate that treatment with $PGF_{2\alpha}$ does not have a detrimental effect on conception rate in gilts. Fertility was similar in $PGF_{2\alpha}$ treated and control groups with three or four of the gilts conceiving in each group. Each animal was bled twice daily during this trial for blood hormone analyses which, along with the heat of summer months, could account for the low conception rates in all groups.

Induction of Farrowing

Farrowing records for the gilts are presented on an individual basis in Table 3 to demonstrate the consistency with which the $PGF_{2\alpha}$ caused its effects. The treated gilts showed signs of milk letdown about 24.8 hours after treatment, while the control gilts began to lactate about 4

Table 2. Conception Rate of Gilts at the First Estrus After Treatment with $PGF_{2\alpha}$ or Saline

Treatment	No. gilts	No. gilts conceiving at first estrus after treatment	Percent conception
$PGF_{2\alpha}$ (days 4, 5)	5	3	60
Saline (days 4, 5)	5	4	80
$PGF_{2\alpha}$ (days 12, 13)	5	3	60
Saline (days 12, 13)	5	3	60

Table 3. Farrowing Time, Litter Size and Weights When Gilts Were Treated with Either $PGF_{2\alpha}$ or Sterile Saline on Day 108 of Gestation

Gilt number	Treatment	Milk letdown (hrs. after treatment)	Farrowing (hrs. after treatment)	No. live pigs at birth	No. dead pigs at birth	No. live pigs at 133 days post breeding	Avg. pig birth wt. per litter (lbs.)
1	$PGF_{2\alpha}$	28	37	8	2	1	1.9
3	"	NR[1]	41	4	0	4	2.6
5	"	24	32	10	0	7	1.8
8	"	24	28	10	0	10	2.4
10	"	24	30	11	0	4	2.0
12	"	24	32	9	1	9	2.6
Mean		24.8	33.3	8.7	–	5.8	2.2
2	Saline	84	98	10	0	3	2.6
4	"	149	156	11	0	11	2.3
6	"	NR	41	6	3	4	2.1
7	"	NR	106	10	2	10	2.6
9	"	98	101	13	0	12	2.5
11	"	NR	126	10	1	10	2.6
Mean		93.7	104.7	10	–	8.3	2.5

[1] Not recorded.

days after treatment. The treated gilts began the farrowing process about 33.3 hours after treatment, while the controls started 104.7 hours after saline injection ($P<.005$). These data indicate that $PGF_{2\alpha}$ may be an effective agent for synchronization of farrowing in swine.

Treated gilts tended to produce fewer live pigs at birth than did controls (8.7 *vs.* 10.0 pigs, respectively) but the difference was not significant. At 133 days after breeding, treated gilts tended to have fewer live pigs than controls. The reduction in birth weight and litter size at 133 days probably is partially due to induction of farrowing about [illegible] days earlier than normal with $PGF_{2\alpha}$. If farrowing was initiated only about one day earlier than normal, these problems would probably be eliminated.

In summary, prostaglandin $F_{2\alpha}$ is an experimental drug at the present time; however, it may prove beneficial to the swine producer in the future. It could be useful for synchronization of estrous cycles or for induction of farrowing at a desired time.