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Induction of Parturition in Sows with Prostaglandin $F_{2\alpha}$

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Abstract : Forty two cross bred sows were used to study the efficacy of prostaglandin $F_{2\alpha}$ on induction of parturition and its effects on sow and litter performance subsequent to farrowing. Twenty mg of prostaglandin $F_{2\alpha}$ was administered as a single intramuscular injection between day 109 and 111 of pregnancy. The response to treatment was 89% and the mean interval to farrowing was 33.3 ± 5.5 hrs. The gestation period of the treated sows were significantly shorter ($p > 0.001$) compared to controls (110 ± 0.8 vs 114.3 ± 1.6 days). The mean birth weight of the piglings in the treated group was found to be significantly lower ($p < 0.05$) than the control (2.62 + 0.33 vs 2.84 + 0.81 lbs). The mean litter size at birth, weaning weight and the number of pigs weaned per litter were not affected by prostaglandin treatment. Day 109 of pregnancy was found to be little early, for induction of successful parturition as treatment at this time resulted in more still-births. Post weaning reproductive performance of the treated sows was also not affected by prostaglandin treatment.

1. Introduction

The development of artificial methods for regulating the onset of parturition in farm animals has long been a goal of animal physiologists. Effective methods for controlling the time of onset of parturition would have several practical applications. Parturition can be induced by the administration of corticosteroid and prostaglandins in cattle, sheep, horses and swine.[2] Daily injections for three days of 75 mg of dexamethasone induced parturition in sows[9] but did not provide an accurate prediction of farrowing time. A single intramuscular injection of prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) given after 110 days of pregnancy will induce the onset of parturition within 40 hrs or less in a high percentage of sows.[4] Subsequent studies using $PGF_{2\alpha}$[3,8] and analogues of $PGF_{2\alpha}$[1,6] have supported these findings. However, considerable variability in response was also reported.[5,7,10] Variability in response was attributed to the effects of genetic and environmental factors.[5] The present study was conducted to assess the efficacy of $PFG_{2\alpha}$ in inducing farrowing in cross bred sows, in Sri Lanka. The effect on litter performance and post weaning sow performance were of particular interest.

2. Experimental

A total of 42 cross bred sows were used in this experiment. The sows were managed intensively at Mahaberiatenne farm, National Livestock Development Board, Teldeniya, Sri Lanka. The elevation in this area is about 1000 ft above sea level, the temperature ranges from 68F° to 84°F, relative humidity 72% and the annual

rainfall is between 55 to 75 inches. The sows in the farm were given locally mixed concentrate feed containing 16% crude protein at the rate of 2 lbs per sow per day before service. Thereafter, the amount of concentrate was gradually increased upto 6 lbs per day per sow before farrowing. Ad-lib feeding was given during the period of lactation. A creep feed of crude protein content of 20% to 21% was gradually introduced to the piglings one week after farrowing and given ad-lib upto 2 months of age when they were weaned from the sow and transferred to the fattening unit.

The experiment was carried out in two stages. Initially, a preliminary trial was done to determine the effective dose of $PGF_{2\alpha}$ to induce farrowing successfully. In this trial, four sows were given $PGF_{2\alpha}$ intramuscularly at the rate of 5 mg per sow, 4 sows with 10 mg and another 4 sows with 20 mg of $PGF_{2\alpha}$.[10] The results of this trial suggested that 20 mg of $PGF_{2\alpha}$ is the optimum dose for induction of parturition in sows. In the experiment proper, 30 sows were used. Nineteen sows were treated with a single intramuscular injection of 20 mg of $PGF_{2\alpha}$ and the balance 11 were kep as controls. All animals were not treated on the same day but on several visits withint one and a half months. The pregnancy period of treated sows varied from day 109 to 111 (day 1 = day of service). The $PGF_{2\alpha}$ treated and the control sows were kept in different sets of farrowing pens. These pens were in pairs, each pair having a common opening so that only the piglings can go through. The sows were housed in such a way that there was no mixing of piglings of the treated and control groups.

Constant observation was made following treatment to determine side effects, to record the interval from injection to the birth of first pigling, the interval between births of successive piglings, signs of dystocia and retained placenta. Baby piglings were wiped dry immediately after birth, numbered and weighed. The number of piglings born alive and the still-births were recorded. Piglings were weaned at the age of 2 months, their weight recorded and transferred to the fattening unit. The sows were served at post weaning oestrus and the time from weaning to fertile oestrus was determined. The litter size and birth weights were also recorded at subsequent farrowing. Student 't' distribution was used to test the significance of treatment effects.

3. Results

The results of the response of sows and litter performance following treatment are summarised in Table 1. Of the 19 animals treated with $PGF_{2\alpha}$, 17 responded to treatment and farrowed within 22 to 44 hrs with a mean interval of 33.3 ± 5.5 hrs. The distribution of sows according to the time interval from the administration of $PGF_{2\alpha}$ until birth is shown in Figure 1, and it can be seen that 7 out of 19 sows farrowed 32 to 37 hours after treatment. The two sows which failed to respond to treatment farrowed 75 hours later. The pregnancy period of the treated sows was significantly reduced ($p < 0.001$) compared to the control group (110.8 ± 0.8 vs 114.3 ± 1.6 days).

There were no signs of dystocia or any significant differences in the time taken from the birth of first pigling to expulsion of placenta, in either group. In both treated and control sows, milk was present in the mammary glands prior to the onset of parturition and normal milk secretion was initiated following parturition except for one sow in the treated group.

TABLE 1. Effects of intramuscular injection of prostaglandin $F_{2\alpha}$ on production characteristics of sows and piglings.

Characteristics		Treated	Control
Total number of animals		19	11
Gestation length (days)	(*a*)	110.8 ± 0.8**	114.3 ± 1.6
Time from injection to farrowing (hours)		33.3 ± 5.5	—
Litter size at birth (numbers/litter)		8.7 ± 2.0	8.8 ± 3.6
Number still-born per litter		1.3 ± 3.3	0.5 ± 1.0
Live pigs at birth (number/litter)		7.4 ± 2.9	8.4 ± 3.9
Mean birth weight/pig (lbs)		2.62 ± 0.33(*)	2.84 ± 0.28
Time from first pigling to expulsion of placenta (hours)		4.8 ± 2.0	4.3 ± 1.7
Live pigs weaned per litter		6.7 ± 1.9	6.8 ± 2.1
Mean weight at weaning (lbs)		27.1 ± 2.5	27.5 ± 3.6
Time from weaning to fertile oestrus (days)		9.3 ± 13.7	9.2 ± 1.1
Mean litter size at subsequent farrowing		8.9 ± 2.7	—
Mean birth weight at subsequent farrowing (lbs)		2.88 ± 0.21	—

(*a*) Mean + standard deviation
(**) Significant at 0.1% level
(*) Significant at 5% level

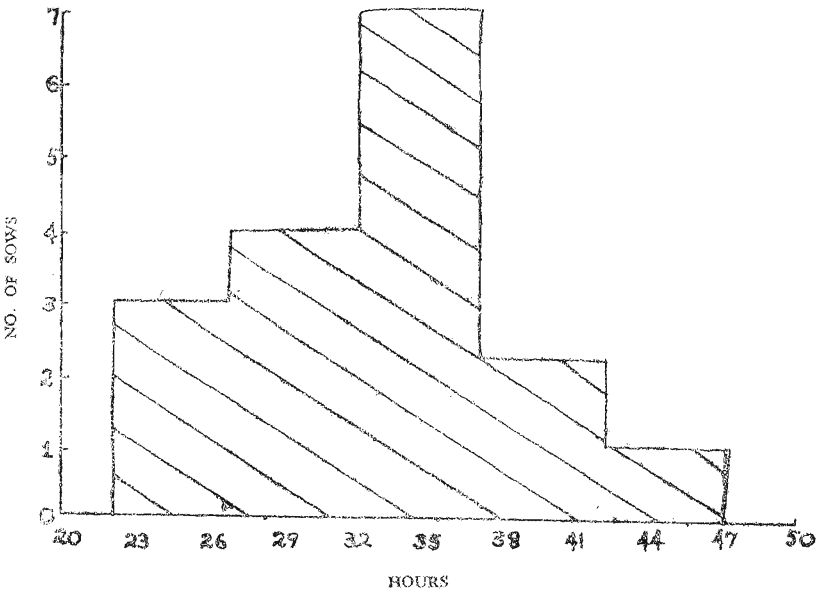

Figure 1.

The number of live and still-born piglings per litter between the two groups did not differ significantly ($p > 0.05$). The mean litter size at birth was 8.7 ± 2.0 and 8.8 ± 3.6 for the treated and control groups, respectively. Number of still-births in the treated group was 22 and the control group 5. In the treated group all the still-births were from the sows treated with $PGF_{2\alpha}$ on day 109 of pregnancy. The mean birth weight of the piglings was significantly reduced ($p < 0.05$) in the treated group compared to controls (2.62 + 0.33 vs 2.84 + 0.8). The weaning weight at 8 weeks and number of piglings weaned did not differ between the treated and control groups.

Soon after weaning, the sows returned to oestrus normally except for one sow in the treated group which returned to oestrus 56 days after weaning and two sows in the control group which took 25 and 34 days, respectively, to return to oestrus. The distribution of the sows according to the period taken from weaning to fertile oestrus is shown in Table 2. It can be seen that the majority of them returned to oestrus within one week after weaning. The mean litter size and birth weight of piglings at subsequent farrowing for the $PGF_{2\alpha}$ treated group were 8.9 ± 2.7 and 2.88 ± 0.21 lbs respectively.

TABLE 2. Frequency distribution of sows according to the time taken from weaning to the first oestrus

	0—3 days	4—6 days	7 –10 days	10 days	Total
Treated	3	10	5	1	19
Control	3	5	—	2	10

In addition to the effects related to parturition, the following behavioural changes were observed in almost all the treated animals immediately after $PGF_{2\alpha}$ treatment. There were increased sweating in the nostril region, increased respiration rate, increased grunting, rooting and biting various objects in the farrowing pen. These reactions were observed 10 minutes after the administration of $PGF_{2\alpha}$ and lasted for about 30 minutes.

4. Discussion

The results of this study demonstrate that administration of 20 mg of $PGF_{2\alpha}$ to pregnant sows after 109 days of pregnancy, induces parturition 33.3 ± 5.5 hours later. Similarly, Diehl and others[3] observed that the interval from administration of $PGF_{2\alpha}$ until birth of first pigling was 33 ± 2 hours. Ash and Heap[1] and Downey

et al[6] found that parturition began about 26 and 27 hours, respectively, after the injection of analogues of $PGF_{2\alpha}$. In the results reported here 89% of the sows farrowed within 22 to 44 hours. This is in agreement with previous studies, reporting 80% to 90% of animals responding to treatment with $PGF_{2\alpha}$.[4,12]

The number of live piglings at birth was not affected by $PGF_{2\alpha}$ treatment. However, the mean birth weight of the piglings in the treated group was significantly lower than the controls. Similar observations were made by others.[5,11,12] This low weight is expected, because parturition was induced and piglings are born 3 days early. Inspite of the low birth weight, the mean weaning weight and the number of piglings weaned at 8 weeks in the treated group did not differ from the controls and this observation again is in agreement with previous studies. Even though there were 22 and 5 still births in the treated and control groups, respectively, the difference was not significant. In the treated group, all the still-births were from sows treated with $PGF_{2\alpha}$ on day 109 of pregnancy. Hence, it is not advisable to induce parturition before day 110 of pregnancy.

Very little data is available on the post weaning performance of $PGF_{2\alpha}$ treated sows. The results of this study clearly demonstrate that post weaning fertile oestrus, subsequent litter size and mean birth weight were not affected by $PGF_{2\alpha}$ treatment.

In conclusion, the results of the present study demonstrates that $PGF_{2\alpha}$ can be used as a management tool to control time of parturition of sows in Sri Lanka. Earlier relevant studies indicate that majority of the still-births occur during the latter stages of farrowing and these losses can be reduced if the exact time of farrowing is known. Further, if parturition can be limited to daytime only, piglet survival would improve in farms where night time farrowings are allowed presently to proceed unattended. Successful utilisation of the induction of farrowing is dependent on having a full control of the breeding programme, adequate facilities and a well trained labour force.

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