The use of Cloprostenol and prostaglandin $F_{2\alpha}$ to induce luteolysis in reindeer calves (*Rangifer tarandus*)

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Abstract: A total of 126 reindeer of about 7 months of age, were isolated from a flock at the end of the breeding season. The animals were treated either with 12.5 mg prostaglandin $F_{2\alpha}$ (n = 41) or 0.25 mg cloprostenol (n = 50). Thirty-five animals were left untreated. Blood samples were collected before treatment and 2½ days later and the plasma progesterone concentrations were determined. A significant fall in progesterone concentration was seen in both treatment groups. A large proportion of animals responded to treatment with cloprostenol than with prostaglandin $F_{2\alpha}$. It was concluded that prostaglandins can be used to induce luteolysis in reindeer.

Key words: Abortion, pregnancy, therapy, corpus luteum.

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Introduction

The pregnancy rate in reindeer is strongly related to body weight (Lenvik et al., 1988 a) and, in southern Norway, has been observed to increase from virtually zero to about 90% when body weight increased from 40 to 50 kg (Lenvik, 1988). Reindeer calves can reach body weights of over 50 kg during their first autumn if they have access to high quality pastures. However, earlier studies have shown that natural body weights below 60 kg are associated with very high calf mortality rates (Lenvik & Aune, 1988). Thus, to increase the production capacity of a reindeer flock, growing calves and heifers with a body weight less than 60 kg should not be subjected to the risk of pregnancy (Lenvik et al., 1988 b) and the subsequent dilemma of the death of the newborn calf or the stress of lactation (Lenvik & Fjellheim, 1987).

In cattle and other ruminants, prostaglandins can be used to cause luteolysis and induce abortion and have been used to control pregnancy in extensive production systems (Roche, 1976). The aim of the present study was to evaluate the effect of prostaglandins given to young reindeer calves at the end of the breeding season.

Materials and methods

A total of 126 young reindeer of about 7 months of age, were isolated from a flock during the last week of November 1987. Animals weighing more than 46 kg body weight were randomly allocated into two groups to be treated either with prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$), 12.5 mg (Dinolytic ®, n = 41) or 0.25 mg cloprostenol (Estrumat ®, n = 50). Thirty-five animals were left untreated and no restriction on live weight was used in this group.

Jugular venous blood samples were collected into heparinized vacutainers for the analysis of plasma progesterone. Two blood samples were collected from all animals, the first immediately prior to treatment and the second 2½ days later. Plasma progeste-

Table 1. Means of live weight and plasma progesterone concentrations prior to and after treatment with 12.5 mg $PGF_{2\alpha}$ (Dinolytic ®) or 0.25 mg Cloprostenol (Estrumat ®)

Treatment group	N	Live Weight		Progesterone level prior to treatment		Progesterone level after treatment		Individual differences
		MEAN[1)]	SEM	MEAN[1)]	SEM	MEAN[1)]	SEM	MEAN[2)]
Untreated	35	44.3^a	0.43	1.3^a	0.3	1.2^a	0.3	$0.1^{n.s.}$
$PGF_{2\alpha}$	41	49.8^b	0.41	3.2^b	0.4	1.5^a	0.3	1.7^{xxx}
Cloprostenol	50	49.4^b	0.35	3.2^b	0.4	0.8^a	0.2	2.4^{xxx}

1) a b:
Means within columns with different superscript differ significantly, $p < 0.05$ (Wilcoxon two-sample test).

2) xxx, n.s.:
level of significance for the difference between individual progesterone concentratiaons prior to and after treatment (Wilcoxon signed rank test). xxx $p < 0.001$, n.s. $p > 0.1$.

rone concentration was determined as described by Benjaminsen & Karlberg (1981). The assay was validated for reindeer plasma. The sensitivity (0.95 confidence limits of the mean of estimates of zero quality controls in all assays, n = 11) was 0.31 ng/ml. In 11 assays the mean estimated progesterone concentrations in steroid free reindeer plasma to which 2 ng/ml and 6 ng/ml had been added were 2.3 ng/ml and 6.5 ng/ml with coefficients of variation between assays of 19.2% and 16.4%, respectively. The within assay coefficient of variation of 10 replicates of the same quality controls (1 and 6 ng/ml) were 8.6% and 10.2%, respectively. The specificity of the antiserum has been described earlier (Andresen & Onstad, 1979).

Udder palpation was performed in 75 animals during the last week in August 1988, to assess whether they were rearing a calf.

The response to treatment was evaluated according to the change in plasma progesterone concentration following treatment. Animals with a progesterone concentration > 2 ng/ml prior to treatment and < 1 ng/ml after treatment were regarded as «responders». Animals with a progesterone concentration < 2 ng/ml prior to treatment were excluded. Other combinations of progesterone concentrations indicated a negative response («non-responders»).

Statistical analysis were performed by SAS (1985) programmes. Differences among means were assesed using the Wilcoxon two-sample test. Differences between individual progesterone concentrations before and after treatment were assessed using the Wilcoxon signed rank test. Data were also subjected to conventional Chi-square tests.

Results

The average concentration of plasma progesterone in both treatment groups before receiving prostaglandin was 3.2 ± 0.4 (± SEM) ng/ml. The untreated group had significantly lower means for both plasma progesterone concentration and live weight than either treatment group had prior to receiving prostaglandin (Table 1).

Treatment with prostaglandin resulted in a significant decrease in progesterone concentrations in both treatment groups while over the same period there was not a significant change in the untreated group (Table 1). The mean concentration of progesterone in does treated with cloprostenol was significantly lower (0.8 ± 0.2 (± SEM) ng/ml) after treatment than in does treated with $PGF_{2\alpha}$ (1.5 ± 0.3 (± SEM) ng/ml, $p = 0.08$). No side effects were seen as a result of treatment.

Table 2. Number of animals with progesterone level < 1 ng/ml (responders) and > 1 ng/ml (non-responders) 2½ days after treatment with $PGF_{2\alpha}$ (12.5 mg) or Cloprostenol (0.25 mg). Animals with progesterone level < 2 ng/ml prior to treatment were excluded.

Progesterone level ng/ml, 2½ days after treatment	Number of animals (%)[1)]	
	$PGF_{2\alpha}$	Cloprostenol
< 1	7 (31.8)[a]	22 (81.5)[b]
> 1	15 (68.2)	5 (18.5)

1) a b: $X^2 = 12.4$, $p < 0.001$.

Grouping the animals into responders and non-responders according to their progesterone concentrations prior to and after treatment (see Materials and Methods) revealed a higher frequency of responders (81.5%) in cloprostenol-treated animals than in $PGF_{2\alpha}$-treated animals (31.8%) (Table 2).

In the following autumn, the udders of 19 untreated animals were palpated and noen found to secrete milk. Among the treated animals, milk was secreted from the palpated udders of 5 out of 36 non-responders and 2 out of 20 responders.

Discussion

The significant fall in progesterone concentrations observed in treated animals (Table 1) indicated that prostaglandins could be used to induce luteolysis in reindeer. To our knowledge there has been no other report in the literature describing the use of prostaglandins in this species.

The average progesterone concentration was lower after treatment, and the number of responders higher in the group treated with cloprostenol than in the group treated with $PGF_{2\alpha}$ (Table 1 and 2). The doses given (12.5 mg $PGF_{2\alpha}$ and 0.25 mg cloprostenol) were chosen on basis of the doses recommended for cattle (25 mg $PGF_{2\alpha}$ and 0.5 mg Cloprostenol), and on the assumption that the given dose should be sufficient to cause luteolysis in reindeer weighing about 50 kg live weight. The lower response-rate obtained with $PGF_{2\alpha}$ could be due to a lower effect of this compound in reindeer than in cattle. A similar phenomenon has been reported in sheep where the appropriate luteolytic dose of $PGF_{2\alpha}$ is 20 mg (Hackett & Robertson, 1980). The corresponding dose of cloprostenol in sheep is only 0.1 mg (Acritopoulou & Haresign, 1980).

Treatment with prostaglandins was performed in the last week of November. At this time of the year the normal breeding season is finished, however, little information is available on the normal reproductive physiology of reindeer, and evidence exists that, in the absence of pregnancy, ovulation can continue into December - January (Mossing & Rydberg, 1982). The ability of two responders in this experiment to produce a calf the following autumn could indicate that pregnancy may be better prevented by treatment at a later stage.

The limited availability of reindeer calves with a high body weight required that restrictions on body weight could not be placed on animals in the untreated group. Therefore this group cannot be regarded to be a part of the same population as the treated animals.

However, the absence of a significant fall in progesterone concentrations in this group would tend to indicate that luteolysis was not induced by handling the animals. This would be in agreement with practical field experience that abortion is not observed after handling individual animals during early pregnancy.

In conclusion, prostaglandins would appear to be effective in causing luteolysis in reindeer and the usefulness of such compounds in preventing pregnancy in young animals looks promising. The further evaluation of prostaglandins in this species should address the treatment of animals at predetermined stages of the reproductive cycle and pregnancy.

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