Induction of parturition in ewes with dexamethasone or dexamethasone and cloprostenol

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Parturition is believed to be initiated when adrenocorticotropic hormone (ACTH) from the fetal pituitary gland causes a release of cortisol from the fetal adrenal cortex (1). The fetal cortisol reduces placental progesterone production and increases placental estrogen production, resulting in release of prostaglandin $F_{2\alpha}$ (PGF) from the uterus (1). Consequently, uterine activity increases, the corpus luteum undergoes luteolysis, and parturition is initiated (1). Dexamethasone and other synthetic glucocorticoids mimic fetal cortisol and have been successfully used to induce parturition in the ewe (2–6). Estrogens have also been used (3). Although PGF causes luteolysis in the ewe (3), it is not consistently effective in inducing parturition (3,5), apparently due to production of progesterone in the placenta or fetal cotyledon which can maintain pregnancy in the absence of the corpus luteum after 50 d of pregnancy (7). In cattle, progesterone production by the corpus luteum is required to maintain pregnancy during the final month of gestation (8). Therefore, either corticosteroids or PGF induces calving in cattle near term, with a combination of the 2 resulting in a shorter and more uniform interval from treatment to calving and fewer induction failures (1).

There are no previous reports on the effect of using a combination of a corticosteroid and PGF for induction of lambing. We hypothesized that treatment with cloprostenol (a PGF analogue) in addition to dexamethasone would result in a more rapid and consistent luteolysis and, hence, reduce the variability in the interval from treatment to lambing compared with dexamethasone alone.

Fifty-two pregnant Suffolk ewes, ranging in age from 1 to 7 y and weighing an average of 86 kg (range 47 to 131 kg) prior to lambing, were used in this study. These ewes were cared for according to guidelines of the Canadian Council on Animal Care (9). Ewes were bred in the fall by rams equipped with crayon harnesses. At 140 d after the last marking (historically gestation averaged 144 d), ewes were randomly assigned to 1 of 3 treatments: DEX, 16 mg dexamethasone (Dexamone 2, rogar/STB, Montreal, Quebec); DEX/CP, a combination of 16 mg dexamethasone plus 250 μg cloprostenol; (Estrumate, Coopers Agropharm, Ajax, Ontario), or CONTROL, 8 ml of 0.9% sterile saline. Ewes were blocked by parity, that is, primiparous ewes were randomized separately from multiparous ewes. All injections were IM, and dexamethasone and cloprostenol were given at separate locations. Ewes were observed every 2 h for the first 24 h after treatment, and continuously thereafter. To facilitate monitoring, ewes were housed individually in pens in a heated barn, fed alfalfa hay cubes ad libitum and 250 g wheat daily, and given free access to water. When parturition was imminent (cervix completely dilated, fetus in the vagina), lambs were delivered vaginally with assistance to procure noncontaminated lambs for another study. The interval from treatment to lambing was recorded to the nearest 15 min.

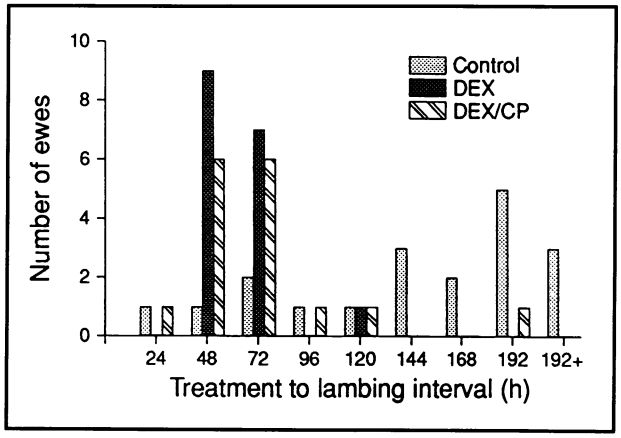

Figure 1. Lambing distribution of ewes treated with saline (CONTROL), dexamethasone (DEX), or dexamethasone and cloprostenol (DEX/CP).

Analysis of variance (10) was used to determine the effect of treatment, parity, and the treatment-by-parity interaction for the interval from treatment to lambing. Means were compared using the Student-Newman-Keuls test (10). Bartlett's homogeneity of variance test (10) was used to determine differences among groups during the interval from treatment to lambing. Chi-square analysis (10) was used to determine differences among groups in the proportion of ewes that had lambed by 72 h after treatment.

There were significant differences between the 3 treatments in the mean of the interval from treatment to lambing (147.4, 51.0, and 62.6 h for CONTROL, DEX, and DEX/CP, respectively), and in the proportion that lambed by 72 h after treatment (Table 1). The effect of parity and the treatment-by-parity interaction were not

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Table 1. Mean and standard deviation[a] (*s*) of the interval from treatment to lambing and the proportion of ewes lambed by 72 h following treatment with saline (CONTROL), dexamethasone (DEX) or dexamethasone and cloprostenol (DEX/CP)

	Group			
	CONTROL	DEX	DEX/CP	Group effect
Treatment to lambing (h)				
Mean	147.4[b]	51.0[c]	62.6[c]	$P < 0.001$
s	83.3[b]	18.0[c]	39.2[d]	$P < 0.001$
Proportion lambed by 72 h	4 of 19[b]	16 of 17[c]	13 of 16[c]	$P < 0.001$

[a]The standard deviation is the square root of the variance
[bcd]Within a row, groups without a common superscript are different ($P < 0.005$)

significant ($P > 0.3$). While the mean interval between treatment and lambing was not significantly different between the DEX and DEX/CP groups, the variance in lambing interval was significantly lower in the DEX group ($P < 0.004$). Injection of 16 mg dexamethasone resulted in the shortest and least variable interval from treatment to lambing. Twenty-nine of 33 ewes treated with DEX and DEX/CP had lambed by 72 h, whereas 15 of 19 ewes treated with saline did not lamb until after 72 h (Figure 1). All lambs were viable upon delivery. There were no ewes with retained placenta.

Our hypothesis that treatment with cloprostenol in addition to dexamethasone would reduce the variability in the interval from treatment to lambing compared with dexamethasone alone was not supported. The reason for the greater variability is not clear. Dexamethasone suppresses placental progesterone production and indirectly causes luteolysis (stimulates release of PGF), whereas cloprostenol treatment causes luteolysis directly. Perhaps the addition of cloprostenol dissociates luteolysis from suppression of placental progesterone production and, hence, makes the interval from treatment to parturition more variable.

Induction of lambing can be a useful management tool to control pregnancy toxemia or synchronize the time of lambing for increasing surveillance and providing assistance. The procedure is safe, effective, and inexpensive. However, accurate breeding records are essential, as efficacy decreases when treatment is given too early in gestation, and the viability of lambs born more than a few days prior to term is likely to be poor.

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