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Reproduction in the cashmere goat: influence of live weight and PGF2 on ovulation rate

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SUMMARY

In July 1996, fifty-six dry cashmere goats (1.5 - 3 years old), reared in South Italy (Potenza) were synchronised for oestrus with progestagen-impregnated intravaginal sponges (45 mg FGA, 9 d) + ProstaglandinF2, (Cloprostenol, i.m., 7th d) + PMSG (300 IU, i.m., 7th d). Ovulatory response in relation to the dose of PG as well as to the live weight was evaluated. The number of corpora lutea and preovulatory follicles were detected by laparoscopy on 7th day after pessary removal. The mean number and quality of corpora lutea are closely related to live weight by cloprostenol dose interaction.

INTRODUCTION

It is well-known that animals interact with many environmental factors and adapt themselves to change by modifying not only their morphophysiological traits, but also their productivity. The introduction of cashmere goats in South Italy raises questions of the animals' "reactivity" to the new environmental conditions. This study involves many aspects, among which not least is reproductive efficiency.

In temperate regions, the cashmere goat also behaves as a seasonal breeder (Restall *et al*., 1992) and its reproductive efficiency would be effectively manipulated by hormonal treatments. In fact, long (22 d) (Corteel et al., 1975) and short (9-l1 d) (Corteel et al., 1982; Martemucci et al., 1992) treatments with progestagen impregnated-intravaginal sponges, associated with PMSG administration, are very effective in inducing oestrus in seasonally anovulatory does and ewes. Shortlasting progestagen treatments appear to be more efficient when associated with luteolysin administration. Nevertheless, the appropriate level of prostaglandin has not yet been established. Moreover the live weight influence on treatment

effectiveness is still unclear.

The solution to this question seems to be even more necessary, considering the fact that the goats recently imported are rather variable in respect to morphological traits, such as body size and hence weight. On this basis, the present study aimed to evaluate the influence of live weight on ovarian response of cashmere does induced to ovulate with different cloprostenol doses.

MATERIALS AND METHODS

The study was carried out in July (out-of-breeding season) on 56 cashmere dry goats, reared in the South of Italy (1350 m a.s.l.; latitude 41° N). Does were grazed on natural pasture with a daily supplementation of commercial feed, given at the rate of 300g/d. The animals aged between 18 and 36 months, were subjected to a 2x2 factorial design, providing 2 PG doses (125 vs 62.5 Rg) and 2 live weight groups (25 ± 1.78 *vs* 34 ± 1.80 kg) experimental design. Oestrus was induced by intravaginal sponges (Chronogest, Intervet, Milano, Italy) containing 45 mg FGA, for 9 days. At the 7th day of progestative treatment, an intramuscular injection of 300 UI PMSG (Intervet, Milano, Italy) and 125 or 62.5 pLg of synthetic prostaglandin (Cloprostenol, I.C.I. 80 996) was given.

Ovulation response was evaluated on the 7th day after sponge removal using laparoscopic techniques as suggested by (Martemucci et al., 1984). The number of corpora lutea, anomalous corpora lutea (> 3 mm, < 3 mm and clear) and large antral follicles (diameter > 4 mm) were recorded for each ovary. Four does which lost vaginal sponges and three that lost the identification number were discarded from analyses.

Data, previously normalised, were subjected to variance analysis, using the GLM procedure (SAS, 1987). Differences between means and percentage were compared by Student's t and chi-square, respectively. Kendall's coefficients between live weight and parameters observed were calculated.

RESULTS AND DISCUSSION

The proportion of ovulating goats does not appear to be significantly affected either by live weight or by cloprostenol dose. However the proportion of ovulating goats ranged from 81.8 to 100%.

As regards ovulation rate (Table 1), the first aspect to stress is a slightly higher ovulatory response in does from the lighter weight group; but this result is not significant (3.28 ± 0.46 *vs* 2.32 ± 0.42; $P>0.05$).

Nevertheless, among these subjects, we noticed that the lower cloprostenol dose produced a better ovulation rate, while, within the other weight group, the same luteolysin dose gave the lowest value of ovulation rate (4.22 ± 0.70 *vs* 1.64 ± 0.56). This leads to consideration of interaction between cloprostenol dose and liveweight.

TABLE 1

Ovarian response.

Live weight	Cloprostenol dose	Goats observed	Goats ovulating	Preovulatory follicles	Corpora Lutea	
					Total	Anomalous
Kg	µg	no.	%	mean±s.e.	mean±s.e.	%
	125	12	100.0	0.25±0.11	2.33±0.61	7.1 ^{Aa}
25±1.78	62.5	9	81.8	0.00±0.13	4.22±0.70^{B}	0.0 ^{A}
	Total	***21***		***0.12±0.08***	***3.28±0.46***	***3.0^{A}***
	125	11	91.7	0.18±0.12	3.00±0.64	30.3 ^{b}
34±1.80	62.5	14	100.0	0.21±0.10	1.64±0.56^{A}	60.9 ^{bc}
	Total	***25***		***0.20±0.08***	***2.32±0.42***	***42.9^{B}***

On column A *vs B* = $P<0.01$; a *vs b vs c* = $P<0.05$.

The positive influence of lower PG doses, especially associated with short progestagen treatments was recorded also in other studies on ewes (Gambacorta et al., 1993) as well as on does (Corteel et al., 1983; Bretzlaff and Madrid, 1989; Gambacorta et. al., 1994). However, the role of prostaglandin in the mechanism of follicular rupture has been well documented in several species, such as the rabbit (O'Grady et al., 1972), pigs (Ainsworth et al., 1979) and sheep (Murdoch and Dunn, 1983; Ronayne et al., 1990) though it has not yet been elucidated.

As concerns weight effect, a negative correlation between live weight and the ovulation rate, within the lower PG treatment, was recorded ($r = -0.44$; $P<0.01$).

The better ovulatory response of lighter does is unclear and no reports are available about dose effect on ovulation rate as well as on prolificacy, related to live weight. Many hypotheses can be formulated.

A negative effect of the overcoming of the typical species weight-limit on follicular rupture was noticed (Gunn, 1982) and a positive influence of the interaction between high protein short flushing treatment and cloprostenol doses on ovulation rate in ewes was recorded (Facciolongo et al., 1995). Besides, a significant effect of PG dose-genotype interaction on prolificacy alone, is well-documented (Hoppe and Slyter, 1989). As regards this question it should be considered also that cashmere-fibre is produced by several genetic lines and this wide variability could effect the ovarian response.

The Cloprostenol dose by live weight interaction would be emphasised if the percentages of anomalous corpora lutea are considered. In fact, the absence of anomalous C.L. in relation to the lower level of luteolysin, within the lighter subjects, was observed (0.0 *vs* 60.9 %; $P<0.01$). On the contrary, the same level produced a worse response, when administered to the heavier does.

As concerns live weight, higher percentage of anomalous corpora lutea in the heavier group was recorded (42.9 *vs 3.0* %; $P<0.01$). This result is further emphasised by the positive and significant correlation observed between live weight and the number of anomalous corpora lutea, in both the doses employed ($r = 0.40$; $P<0.05$ and $r = 0.53$; $P<0.01$, respectively for 125µg and 62.5 µg of PG).

The average of antral follicles was very low and it was not affected either by live weight or cloprostenol doses.

CONCLUSION

The results of the present experiment suggest the following conclusions:

- ovulation response (number and quality of corpora lutea) is closely related to live weight by cloprostenol dose interaction. Moreover lighter live weight, associated with the lower dose, produced a better response;

- the results should be particularly emphasised since they are similar or even better, compared to those reported in a local breed. This leads us to assert that cashmere goat, as regards the studied parameters, gave a satisfactory first result of adaptability to our environmental conditions; - further investigations are necessary in order to evaluate also the influence of genetic variability on the studied parameters.

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