Synchronization of Oestrus in Goats with Progestogen Sponges and Short Term Combined FGA, PGF2α Protocols

G. Martemucci, D. Casamassima, and A. G. D'Alessandro

Abstract—The study aimed to evaluated the reproductive performance response to short term oestrus synchronization during the transition period. One hundred and sixty-five indigenous multiparous non-lactating goats were subdivided into the following six treatment groups for oestrus synchronization: NT control Group (N= 30), Fe-21d, FGA vaginal sponge for 21days+eCG at 19[th]d; FPe-11d, FGA 11d + PGF2α and eCG at 9th d; FPe-10d, FGA 10d+ PGF2α and eCG at 8th d; FPe-9d, FGA 9d +PGF2α and eCG at 7[th]d; PFe-5d, PGF2α at d0 + FGA 5d + eCG at 5[th]d. The goats were natural mated (1 male/6 females). Fecundity rates (n. births /n. females treated x 100) were statistically higher (P<0.05) in short term FPe-9d (157.9%), FPe- 11d (115.4%), FPe-10d (111.1%) and PFe-5d (107.7%) groups compared to the NT control Group (66.7%).

Keywords—Goats, oestrus synchronization, short-term protocols

I. INTRODUCTION

THE reproductive control of dairy goats is strongly required by farmers to plan the kidding toward the season with better conditions of pasture, in order to improve milk production, kid growth and to satisfy marketing of meat, milk and cheese.

Progesterone/progestagen treatments have been widely used to synchronise oestrus, by using intravaginal devices or subcutaneous implants for long periods (10 to 21 days) [1]-[2]. However, long term progestagen treatments have been associated to low fertility [3]-[4]. Furthermore, since in the European Union the use of progestagen is controlled (Maximum residue limits, R.D. 2178/2004) dairy goats farmers cannot use products during the treatment period. New knowledge on goats such as the wavelike pattern of follicular dynamics [5] and high priming levels of progesterone on follicular wave turnover [6] have focused on new strategic approaches for the development of short term oestrus synchronization protocols.

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The present study aimed to evaluate the efficiency of induction/synchronization of oestrus on kidding performance in indigenous goats synchronized with progestagen and short term combined FGA, PGF2α protocols.

II. MATERIALS AND METHODS

Location

The trial was carried out in June, at the beginning of the transitional period, in south Italy (Apulia, 41° latitude north).

Animals and Management

One hundred and sixty-five indigenous multiparous non-lactating goats reared under semi-extensive conditions were used. The females, according to age, body weight (40.5±4.2 kg) and body conditions scores (2.5-3.5, scale 1-5) were assigned to the control (N=30, no treated, NT) and the following six treatment groups (N=27) (Fig. 1):

- NT Group, the control where no treated goats were exposed to fertile bucks for a 30 days period;
- Fe-21d Group, FGA (fluorogestone acetate intravaginal sponges, 45 mg, Intervet, Milan, Italy) treatment for 21 days + eCG (equine chorionic gonadotrophin, Ciclogonina, 400 IU, Intervet, Milan), i.m. on the 19th day at sponge removal (s.r.);
- FPe-11d Group, FGA for 11 days + PGF2α (Cloprostenol, ICI, Estrumate, Schering-Plough, Milan, 50 μg i.m.) and eCG (400 IU) on the 9th day;
- FPe-10d Group, FGA for 10 days + PGF2α (50 μg) and eCG (400 IU) on the 8th day;
- FPe-9d Group, FGA for 9 days + PGF2α (50 μg) and eCG (400 IU) on the 7th day;
- PFe-5d Group, received intramuscular injection of PGF2α (Cloprostenol, 50 μg) at sponge insertion (FGA for 5days) and eCG (400 IU) at s.r..

The bucks were previously treated with GnRH (a GnRH analogue, Fertagyl, Intervet, 8 doses of 100 μg, i.m.) for 5 days (i.e. 4 doses every 12h and 4 doses every 24h) in order to improve their sexual activity. Thus, the females were placed into the buck's pen (1 male/6 females) 24 hours after pessary removal. Males were alternated in the pens every 8 h until 120 h after the end of treatments. The NT Group was exposed for mating to five bucks for a 30 days period. At kidding, the

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number of kids born per doe were recorded and calculated: /n. females treated x 100). Percentages of fertility, prolificacy and fecundity were compared between treatment groups using the chi-square test [7].

III. RESULTS AND DISCUSSION

Three females were excluded from the data because the loss of vaginal sponges.Reproductive performance of goats are reported in Table 1. Fertility rate of no treated goats (NT Group, control) was low (53.3%), confirming the transition period of does at the time of treatment. Fertility rates were higher in FPe-9d Group (73.0%) and lower in Fe-21d and Control groups (55.5 and 53.3%, P>0.05). Prolificacy rate was higher in the FPe-10d treated goats (175.9 %), although not significant.Reproductive performance of goats was not significantly different (P>0.05) among the hormonal treatment groups. However, fecundity rates were statistically higher (P<0.05) in short term FPe-9-day (157.9%), FPe-11-day (115.4%), FPe-10-day (111.1%) and PFe-5-day (107.7%) groups compared to the control (66.7%). The lesser efficiency of long term progestogen treatment (Fe-21d), could be attributed to sub-luteal serum progesterone concentration observed at the end of the long term treatment [8]-[9], the persistence of the largest follicle [9], the impairment of sperm transport in the genital tract of the progestagen treated females [10].The efficiency of FPe (FGA + PGF2α + eCG) protocol for 10-12 days has been reported also in other studies [11]- [12] and is given by the fact that progestagen prevents new corpora lutea formation while PGF2α ensures the luteolysis and eCG improves the synchronization [1]-[13].The efficiency of PGF2α-FGA-eCG-5d could be explained by the fact that PGF2α injection at the time of the FGA sponge insertion for 5 days promotes the growth of a large follicle, which is aged about 5 days at end of treatment and intended to ovulate in most does with subsequent fertile breeding [14]-[15], like it was in most does in this study.In conclusion, this study showed that FGA- PGF2α-eCG-9- to 11-days treatments were effective to synchronize oestrus in goats during the transition season under field condition in flocks where natural services were used. Also PGF2α-FGA-eCG as shorter-time 5-day treatment has been found effective to provide acceptable levels of reproductive performances after natural mating.A higher number of does could provide more satisfactory results in statistical terms.

REFERENCES

[1] R. Gordon, "*Controlled reproduction in sheep and goats. In: Artificial control of estrus and ovulation*", Gordon IR (Ed.), CAB International, New York, 1997, pp. 87-89.
[2] W. Holtz, "Recent developments in assisted reproduction in goats", *Small Rumin. Res.*, Vol. 60, pp 95–110, 2005.
[3] C. Viñoles, M. Forsberg, G. Banchero, and E. Rubianes, "Effect of long-term and short-term progestagen treatment on follicular development and pregnancy rate in cyclic ewes", *Theriogenology*, vol. 55, pp. 993-1004, 2001.
[4] M. G. Diskin, E. G. Austin, and J. F. Roche, "Exogenous hormonal manipulation of ovarian activity in cattle". *Dom. Anim. Endocr.*, vol. 23, pp. 211-228, 2002.
[5] O. J. Ginther, and K. Kot, "Follicular dynamics during the ovulatory season in goats", *Theriogenology*, vol. 42, pp. 987-1001. 1994
[6] A. Menchaca, and E. Rubianes, "Relation between progesterone concentrations during the early luteal phase and follicular dynamics in goats", *Theriogenology,* vol. 57, pp. 1411-1419, 2002.
[7] G.W. Snedecor, and W. G. Cochran, Statistical Methods, 7th ed. The Iowa State University Press, Ames, USA., 1980.
[8] O. Gaston-Parry, K. Heasman, J. K. E. Nemorin, and T. J., Robinson,. "A radioimmunoassay for fluorogestone acetate (FGA) and its application to the measurement of plasma FGA and progesterone in ewes treated with FGA-impregnated intravaginal sponges", *Aust. J. Biol. Sci.* vol. 41, pp. 57-67,.1988.
[9] C. Viñoles, A. Meikle, M. Forsberg, and E. Rubianes, "The effect of subluteal levels of exogenous progesterone on follicular dynamics and endocrine patterns during the luteal phase of the ewe. *Theriogenology,* vol. 51, pp. 1351-1361, 1999.
[10] T. D. Quinlivan, and T. J. Robinson , "Numbers of spermatozoa in the genital tract after artificial insemination of progestagen-treated ewes" *J. Reprod. Fert.*, vol. 19, pp. 73-86, 1969
[11] J. M. Corteel, B. Leboeuf, and G. Baril, "Artificial breeding of adult goats and kids induced with hormones to ovulate outside the breeding season". *Small Rum. Res.*, vol. 1, pp. 19-33, 1988.
[12] B. Leboeuf, D. Forgerit, D. Bernelas, J. L. Pougnard, E. Senty, and M. A., Driancourt, *Theriogenology,* vol. 60, pp. 1371—1378, 2003.
[13] G. Martemucci, and A. G. D'Alessandro, "Strategie di miglioramento dell'efficienza riproduttiva negli ovini. Sincronizzazione farmacologia degli estri e delle ovulazioni. (Strategies for improve reproductive efficiency in sheep: pharmacological synchronization of estrus and ovulation)", *Agricoltura Ricerca*, vol. 183, pp. 3-18, 1999.
[14] E. Rubianes, and A. Menchaca, "The pattern and manipulation of ovarian follicular growth in goats", *Anim. Reprod. Sci.,* vol. 78, pp. 271-287, 2003.
[15] A. Menchaca, and E. Rubianes, "New treatments associated with timed artificial insemination in small ruminants", *Reprod. Fert. Dev.*, vol. 16, pp. 403-413, 2004.

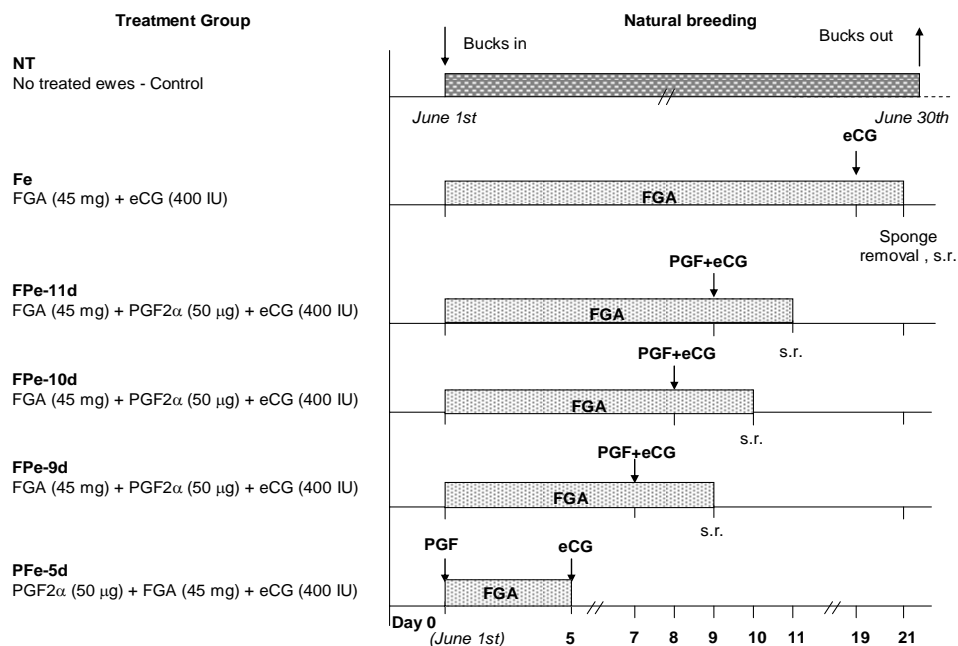fertility (n. goats kidding/n. goats treated x 100), prolificacy

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TABLE 1 – EXPERIMENTAL DESIGN

TABLE II
EFFECT OF TREATMENT ON REPRODUCTIVE PERFORMANCE

Treatment Group [(1)]	Treated Goats N.	Fertility %	Prolificacy %	Fecundity %
NT-Control	30	53.3	125.0	66.7 b
Fe – 21d	27	55.5	166.7	92.6 ab
FPe -11d	26	65.4	164.7	115.4 a
FPe -10d	27	63.0	176.0	111.1 a
FPe -9d	26	73.0	157.9	115.4 a
PFe -5d	26	65.4	168.7	107.7 a

[(1)] NT, no treated; Fe, FGA+eCG; PFe, PGF2α+FGA+eCG.
a, b: $P<0.05$