

BRIEF COMMUNICATION: EFFECT OF POST-MATING PROGESTAGEN ADMINISTRATION ON PREGNANCY RATE IN CROSSBRED GOATS FOLLOWING AN INDUCED ESTRUS.

Comunicación breve: Efecto de la administración postmonta de un progestágeno sobre la tasa de preñez en cabras mestizas luego de un celo inducido.

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ABSTRACT

Estrus induced with progesterone or progestagens have low fertility compared to natural estrus. However, post-mating progesterone administration has been reported by increases embryo development and pregnancy rate; therefore the aim of this study was to evaluate the effect of post-mating progestagen administration on pregnancy rate after medroxyprogesterone acetate (MAP) induced estrus in crossbred goats. Estrus induction was started at 31.3 ± 1.7 days post-partum with intravaginal sponges impregnated with 60 mg of MAP during 14 days and at time of sponge removal were applied 500 IU of eCG intramuscular. Estrus was detected every 6 hours from 24 hours onwards after sponge withdrawal. Goats were naturally mated with two entry bucks. Five days post-mating, mated goats were randomly assorted into two groups, control group (n=18), without any treatment, and MAP group (n=18), receiving a sponge with 60 mg of MAP for fourteen days. Ultrasonographic diagnosis of pregnancy was performed at day 50 post-mating. MAP treatment, did not affect the pregnancy rate, with 44.4% (8/18) in MAP group, while in control group was 55.5% (10/18), $P > 0.05$. In conclusion, MAP treatment with a sponge impregnated with 60 mg of MAP between days 5 and 19 post-mating did not affect the pregnancy rate after progestagen induced estrus during the early post-partum period in crossbred tropical goats.

Key words: Goats, post-partum, estrus synchronization, progestagen, pregnancy.

RESUMEN

Los celos inducidos con progesterona o progestagenos son de menor fertilidad en comparación con los celos naturales. Sin embargo, la administración postmonta de progesterona ha sido reportada por incrementar el desarrollo embrionario y la tasa de preñez; por lo tanto, el propósito de este estudio fue evaluar el efecto de la administración postmonta de un progestageno sobre la tasa de preñez en cabras mestizas tropicales luego de un celo inducido con acetato de medroxiprogesterona (MAP) durante el periodo temprano postparto. La inducción del celo se inicio el día $31,3 \pm 1,7$ postparto mediante la utilización de esponjas intravaginales impregnadas con 60 mg de MAP durante 14 días y al momento del retiro de las esponjas se aplicaron 500 UI de eCG, vía intramuscular. El celo fue detectado cada seis horas a partir de 24 horas de retiradas las esponjas. El servicio se realizó por monta natural con dos machos enteros. Cinco días luego de la monta, las cabras servidas fueron distribuidas de forma aleatoria en dos grupos, el grupo control (n=18), sin tratamiento; y el grupo MAP (n=18), que recibió una esponja con 60 mg de MAP por 14 días. El diagnóstico ultrasonográfico de preñez se realizó a los 50 días postmonta. El tratamiento con MAP no afectó la tasa de preñez, con 44,4% (8/18) en el grupo MAP, mientras que en el grupo control fue de 55,5% (10/18), $P > 0,05$. En conclusión, el tratamiento con una esponja impregnadas con 60 mg de MAP entre los días 5 y 19 postmonta no afectó la tasa de preñez luego de un celo inducido durante el periodo postparto temprano en cabras mestizas tropicales.

Palabras clave: Cabras, postparto, sincronización del celo, progestágeno, preñez.

INTRODUCTION

In ruminants, pregnancy establishment need that the embryo enters into an uterus stimulated by progesterone. Additionally, the embryo needs to grow, develop and produce IFN τ to block PGF $_{2\alpha}$ synthesis [27]. *Conceptus* development depends of the synchrony between the embryo and the uterus and this synchrony is regulated by the postovulatory moment, when progesterone levels increase. When this increase occur early, the embryo development is the highest in both cows (*Bos taurus-indicus*) and ewes (*Ovis aries*) [19,22].

Progestagen to estrus induction has been reported to reduce fertility in goats (*Capra hircus*) and ewes [1,10,29], probably by affect quality of oocytes, sperm transport and LH releases [10,12,14,15,23]. However, post-mating progesterone administration has been reported to increase the embryo survival and pregnancy rates in cows [20], with *conceptus* development and size being improved when progesterone was administrated between days 5 and 9 in cows [18]; while in ewes, early postovulatory progesterone administration increased similarly the *conceptus* development and IFN τ synthesis [3,24]. Additionally, in goats, few information is available in the scientific literature about the effects of progestagen administration on *conceptus* development, IFN τ secretion or pregnancy rates, and only one study [2], reported a beneficial effect of progestagen treatment on embryo survival and pregnancy rate in goats submitted to fresh demi-embryos transfer (62 and 34% vs 38 and 25% to treated and control, respectively). Therefore, the aim of the present study was to determinate the effect of MAP administration on pregnancy rate following an induced estrus after a MAP priming during the early post-partum in goats under tropical conditions.

MATERIALS AND METHODS

The present study was carried out from August to November 2006 in a farm located in the County of Casigua, Falcon State, Venezuela. This area is characterized by a very dry tropical forest with a daily temperature ranking from 23 to 29°C and a rainfall range of 500 and 1000 mm/year [8]. Thirty six healthy multiparous crossbred goats with a body weight of 35.4 $\pm$ 3.7 kg were used. Goats were grazing on cultivated pastures consisting of Estrella grass (*Cynodon nlenfuensis*).

Estrus synchronization was started at day 31.3 $\pm$ 1.7 post-partum and goats were treated with an intravaginal sponge (made by the authors) containing 60 mg of medroxyprogesterone (Depo-provera®, Pfizer, USA) for 14 days and 500 IU i.m of eCG (Folligon®, Intervet, Holland) at sponge removal. Estrus was detected with the help of two entry buck every 6 hours from 24 hours onwards after sponge withdrawal. Goats were mated with the same males at least once. Five days post-mating, goats were divided randomly into two groups: control group (n=18), not treated; and MAP group

(n=18), with goats receiving an intravaginal sponge containing 60 mg of MAP for 14 days. For pregnancy diagnosis, goats were evaluated by means of mode B real-time transrectal ultrasonography with a 5 MHz linear probe 50 days after mating. Pregnancy rates were compared through chi-square test, using the Statistical Analysis System [28] and differences were considered significant when P<0.05.

RESULTS AND DISCUSSION

Estrus was induced in 36/36 goats (100%) and the interval from sponge removal to estrus was 49.3 $\pm$ 5.8 hours. In the present study non goats returned to estrus, and this compressible in MAP group by its suppressive effect, but no in control group, because use of 500 UI of eCG after progestagen priming has been reported by a high incidence of return to estrus between four to eight days after the estrus induced [25].

Pregnancy rate was 50% (18/36), which was similar to the 52.6% reported by Dogan et al. [7], but lower than those reported by Freitas and Salles [9] and Gonzalez et al. [11], 87% and 76.9%, respectively. In ewes, estrus synchronization with progestagen has been reported to lead to lower pregnancy rates due to factors such as alteration in patterns of LH release, quality of oocyte, in the sperm transport and survival in the female reproductive tract and in the quality of embryos [10,12,14,15,23,26]. However, in goats the effect of estrus synchronization with progestagen on fertility is controversial. Baril et al. [1] and Wildeus [29] reported decreased conception rates, while others did not observed a negative effect [6, 13, 16, 17].

Post-mating progestagen administration did not significantly affect pregnancy rate (P>0.05; TABLE I). No other studies evaluating the effect of post-mating MAP administration on pregnancy in goats after an induced estrus have been published, but the results of the present study agree with Davies and Beck [5], whom reported that pregnancy rates in ewes lambs treated with MAP intramuscularly from day 5 to 26 post-mating (57.5%) or with intravaginal sponges (67.5%) did not differ in comparison with control group (72.2%, P>0.05). In cows, early post-mating progesterone administration has been reported to increase *conceptus* development, IFN τ secretion and pregnancy rates [18,19]. In ewes, Carey et al. [3] using 25 mg/day of progesterone from days 1.5 to 12 post-mating observed beneficial effects on blastocyst diameter, *conceptus* development and IFN τ secretion.

TABLE I
EFFECT OF POST-MATING MAP ADMINISTRATION
ON PREGNANCY RATE / EFECTO DE LA ADMINISTRACIÓN
POSTMONTA DE MAP SOBRE LA TASA DE PREÑEZ.

Group	Pregnancy rate (%)
Control	10/18 (55.5%)
MAP	8/18 (44.4%)

Medroxyprogesterone acetate is 20 times more potent than progesterone, and possibly the effect of progestagen administration could be exacerbating the negative effects of estrus synchronization with progestagen on fertility [1,29]. Additionally, the absence of a beneficial effect of MAP administration observed in the present study could be a consequence of a high dose of MAP or of the moment when treatment was started. In the present study a dose of 60 mg of MAP was used and this could promote a premature prostaglandin secretion before that the *conceptus* reaches the IFN γ producing stage, with the subsequent luteolysis. Progesterone administration shortens estrus cycle in goats [21] and the administration of progesterone alone or in combination with estradiol, increases PGFM levels in ovariectomized goats [4]. However, in ewes Pope et al. [24], observed that administration of 6 mg of progesterone from days 2 to 4 post-mating shortened the length of estrus cycle in non-pregnant ewes but increased blastocyst development in those that were pregnant.

On the other hand, the moment when MAP treatment begins could affect the success. In the present study, treatment was started five days after mating, which was late in comparison with Carey et al. [3], whom began the progesterone treatment 36 hours post-mating, and this finding is in agreement with studies reporting a increase of embryo development when the increase of progesterone levels was early in the postovulatory period [19,22]. However, in cows a beneficial effect of post-mating progesterone administration was observed when treatment was started before day six after service [18,20].

CONCLUSIONS

The evaluated regimen of post-mating progestagen administration (sponge containing 60 mg of MAP, from day 5 to 19 post-mating) did not affect the pregnancy rate following a progestagen induced estrus during the early post-partum period in tropical goats. Effects of other dose of MAP or progesterone and other timings for treatment after either a natural estrus or induced with a hormone different from progestagen, must be studied with the aim to determinate whether progestagen/progesterone post-mating treatment in goats has similar effects to those observed in ewes and cows. Additionally, an earlier pregnancy diagnosis and several ultrasonographic evaluations are recommended to evaluate the effects of MAP treatment on embryo development and mortality.

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BIBLIOGRAPHIC REFERENCES

- [1] BARIL, G.; FREITAS, V.J.F.; SAUMANDE, J. Les traitements progestagènes d'induction/synchronisation de l'oestrus chez la chèvre: le point sur les recherches récentes. **Rev. Méd. Vét.** 149:359-366. 1998.
- [2] BECKETT, D.M.; OPPENHEIM, S.M.; MOYER, A.L.; BONDURANT, R.H.; ROWE, J.D.; ANDERSON, G.B. Progestin implants can rescue demi-embryo pregnancies in goats: a case study. **Theriogenol.** 51:1505-1511. 1999.
- [3] CAREY S, M.; BAZER, F.W.; SPENCER, T.E. Progesterone regulation of preimplantation conceptus growth and galectin 15 (LGALS15) in the ovine uterus. **Biol. Reprod.** 75:289-296. 2006.
- [4] COOKE, R.G.; AHMAD, N.; NICHOLSON, T. Effect of progesterone and estradiol-17 β on oxytocin-induced PGF2 α release and endometrial oxytocin receptor concentration in ovariectomized goat. **Prostag. Other Lip. Mediat.** 55:109-120. 1998.
- [5] DAVIES, M.C.G.; BECK, N.F.G. Plasma hormone profiles and fertility in the ewes lambs given progestagen supplementation after mating. **Theriogenol.** 38:513-526. 1992.
- [6] DOGAN, I.; NUR, Z.; GUNAY, U.; SAGIRKAYA, H.; SOYLU, M.K.; SONMEZ, C. Estrous synchronization during the natural breeding season in Anatolian black does. **Vet. Med. - Czech.** 50 (1): 33-38. 2005.
- [7] DOGAN, I.; NUR, Z.; GUNAY, U.; SOYLU, M.K.; SONMEZ, C. Comparison of fluorgestone and medroxyprogesterone intravaginal sponges for oestrus synchronization in Saanen does during the transition period. **S. Afr. J. Anim. Sci.** 34(1):18-22. 2004.
- [8] EWEL, J.; MADRIZ, A.; TOSI, A. Bosque muy seco tropical. **Zonas de vida de Venezuela.** Ministerio de Agricultura y Cría/Dirección de Investigación. Capitulo 4. 2da Ed. Editorial Sucre, Caracas, Venezuela, 64-73 pp. 1968.
- [9] FREITAS, V.J.F.; SALLES, M.G.F. Adaptation of eCG (equine Chorionic Gonadotrophin) for estrus synchronization of dairy goats raised in Northeast Brazil: preliminary results. In: **Proceedings of the 7th International Conference on Goats**, Tours, May 15-21. France. L. Gruner and Y. Chebert (Eds) 465-466 pp. 2000.
- [10] GONZÁLEZ-BULNES, A.; VEIGA-LÓPEZ, A.; GARCÍA, P.; GARCÍA-GARCÍA, R.M.; ARIZNAVARRETA, C.; SÁNCHEZ, M.A.; TRESGUERRES, J.A.F.; COCERO,

- M.J.; FLORES, J.M. Effects of progestagens and prostaglandin analogues on ovarian function and embryo viability in sheep. **Theriogenol.** 63: 2523-2534. 2005.
- [11] GONZÁLEZ, C.; GOICOCHEA, J.; PEROZO, F.; MADRID, N. Influencia del anestro postparto, lactación y amamantamiento sobre la eficiencia de los tratamientos de sincronización del celo en ovejas y cabras. **Rev. Agro. (LUZ)** 7:245-253. 1990.
- [12] GORDON, I. Hormonal control of reproduction in sheep. **Proc. Br. Soc. Anim. Prod.** 4:79-93. 1975.
- [13] GREYLING, J.P.C.; VAN DER NEST, M. Synchronization of oestrus in goats: dose effect of progestagen. **Small Rum. Res.** 36: 201-207. 2000.
- [14] HAWK, H.W.; CONLEY, H.H. Sperm transport in ewes administered synthetic progestagen. **J. Anim. Sci.** 33:255-256. 1971.
- [15] KILLIAN, D.B.; KIESLING, D.O.; WARREN, J.R. Life-span of corpora lutea induced in estrous-synchronized cycling and anoestrous ewes. **J. Anim. Sci.** 61:210. 1985.
- [16] KUSINA, N.T.; TARWIREI, F.; HAMUDIKUWUNDA, H.; AGUMBA, G.; MUKWENA, J. A comparison of the effects of progesterone sponges and ear implants, PGF₂ α , and their combination on efficacy of estrus synchronization and fertility of Mashona goat does. **Theriogenol** 53, 1567-1580. 2000.
- [17] LASSALA, A.; HERNÁNDEZ-CERÓN, J.; RODRÍGUEZ-MALTOS, R.; GUTIÉRREZ, C.G. The influence of the corpus luteum on ovarian follicular dynamics during estrous synchronization in goats. **Anim. Reprod. Sci.** 84: 369-375. 2004.
- [18] MANN, G.E.; FRAY, M.D.; LAMMING, G.E. Effects of time of progesterone supplementation on embryo development and interferon- τ production in the cow. **Vet. J.** 171:500-503. 2006.
- [19] MANN, G.E.; LAMMING, G.E. Relationship between maternal endocrine environment, early embryo development and inhibition of luteolytic mechanism in cows. **Reprod.** 121:171-180. 2001.
- [20] MANN, G.E.; LAMMING, G.E. The influence of progesterone during early pregnancy in cattle. **Reprod. Dom. Anim.** 34:269-274. 1999.
- [21] MENCHACA, A.; RUBIANES, E. Effects of high progesterone concentrations during the early phase on the length of the ovulatory cycle of goats. **Anim. Rep. Sci.** 68:69-76. 2001.
- [22] NEPHEW, K.P.; CARDENAS, H.; MCCLURE, K.E.; BAZER, F.W.; POPE, W.F. Effects of administration of human chorionic gonadotropin or progesterone before maternal recognition of pregnancy on blastocyst development and pregnancy in sheep. **J. Reprod. Fertil.** (Suppl) 54:317-328. 1991.
- [23] PEARCE, D.T.; ROBINSON, T.J. Plasma progesterone concentrations, ovarian and endocrinological responses and sperm transport in ewes with synchronized oestrus. **J. Reprod. Fertil.** 75, 49-62. 1985.
- [24] POPE, W.F.; CARDENAS, H.; WILEY, T.M.; MCCLURE, K.E. Dose-response relationships of exogenous progesterone shortly after ovulation on estrous cycle length, blastocyst development and fertility in sheep. **Anim. Reprod. Sci.** 38 109-117. 1995.
- [25] REGUEIRO, M.; PÉREZ, C. R.; GANZABAL, A.; ABA, M.; FORSBERG, M. Effect of medroxyprogesterone acetate and eCG treatment on the reproductive performance of dairy goats. **Small Rum. Res.** 33(3):223-230. 1999.
- [26] SCARAMUZZI, R.J.; DOWNING, J.A.; CAMPBELL, B.K.; COGNIE, Y. Control of fertility and fecundity of sheep by means of hormonal manipulation. **Aust. J. Biol. Sci.** 41:37-45. 1988.
- [27] SPENCER, T.E.; BAZER, F.W. Ovine interferon tau suppresses transcription of the estrogen receptor and oxytocin receptor genes in ovine endometrium. **Endocrinol.** 137:1144-1147. 1996.
- [28] STATISTICAL ANALYSIS SYSTEM INSTITUTE (SAS). SAS/STAT User's Guide, Version 8.2. Cary, NC; USA. 2001.
- [29] WILDEUS, S. Current concepts in synchronization of estrus: sheep and goats, **Proc. Am. Soc. Anim. Sci.** 1-14. 1999.