

Induction of Estrus during the Non-Breeding Season in Egyptian Baladi Goats

Mohamed MEDAN¹), Abdel-Hamid SHALABY¹), Sayed SHARAWY¹), Gen WATANABE²) and Kazuyoshi TAYA²)*

¹Department of Theriogenology, Faculty of Veterinary Medicine, Suez Canal University, Ismailia, Egypt and ²Laboratory of Veterinary Physiology, Tokyo University of Agriculture and Technology, 3-5-8 Saiwai-cho, Fuchu, Tokyo 183-8509, Japan

(Received 10 June 2001/Accepted 17 September 2001)

ABSTRACT. The induction of estrus during the non-breeding season was investigated in 100 Egyptian Baladi goats (*Capra hircus*). All animals assigned to treatments had low progesterone concentrations (<0.5 ng/ml) tested 2 times 10 days apart to confirm anestrus condition. Animals were assigned to three experimental groups. A group of animals received subcutaneous norgestomet ear implant for 11 days and a single i.m injection of PGF2 α 24 hr before implant removal (group I; n=40). Second group of animals received subcutaneous norgestomet ear implant for 11 days and a single i.m injection of PGF2 α 24 hr before implant removal and gonadotropin releasing hormone 24 hr after implant removal (group II; n=40). Third group of animals received no treatment (control group; n=20). The percentage of goats that showed estrous behavior during the first 72 hr after implant removal was 77.5, 85.0% and 10.0% in group I, group II and control group, respectively. The fertility rate was 57.5, 70.0% and 10.0% in group I, group II and control group, respectively. In conclusion, estrus can be induced in seasonally anestrous Egyptian Baladi goats using norgestomet and PGF2 α and the injection of GnRH 24 hr after norgestomet implant removal synchronized ovulation in a higher percentage of goats.

KEY WORDS: anestrus, caprine, induction of estrus.

J. Vet. Med. Sci. 64(1): 83–85, 2002

Attempts to induce estrus in dairy goats during the non-breeding season have primarily involved the use of exogenous progesterone and/or gonadotropins [1, 7]. Also, photoperiod manipulation [2] and sudden introduction of males [14] induced estrus during the non-breeding season in goats. Pregnancy rates as high as 40–60% have been attained out of breeding season [7], and administration of equine chorionic gonadotropin has been shown to be necessary to get a satisfactory ovulatory response in anestrous goats [10]. Knight *et al.* [9] demonstrated that multiple injections of small doses of GnRH induce ovulation and normal luteal function in seasonally anestrous goats at peak lactation. A single i.m. injection of equine chorionic gonadotropin (eCG) administered at the end of progestagen treatment advanced the onset of estrus, increased ovulation rate and induced a tighter synchrony of ovulation [6]. Unfortunately, in dairy goats, repeated treatment with eCG induces the production of anti-eCG antibodies that clearly have negative effect on reproduction [11]. The objective of this study was to determine the effects of a synthetic progesterone (norgestomet) alone or in combination with synthetic GnRH (buserelin acetate) on induction of estrus and fertility in anestrous goats.

This study was carried out using 100 Egyptian Baladi goats (*Capra hircus*) ranging from 2 to 5 years of age during June 2000 in the farm of Faculty of Veterinary Medicine, Suez Canal University, Egypt. All animals assigned to treatments had low progesterone concentrations (<0.5 ng/ml) tested 2 times 10 days apart to confirm anestrus condition. Estrus detection was carried out using 5 mature bucks 6 hr intervals (male to female ratio was 1:20) and all animals

exhibited estrus were allowed to be mated. The time of standing estrus, date of mating, date of kidding and litter size were recorded. Does were randomly assigned to receive either subcutaneous implants containing 3 mg norgestomet (Syncro-Mate-B (1/2 implant), Sanofi Animal Health, Inc., Overland Park, KS, U.S.A.) inserted on the back of the ear for 11 days and a single i.m injection of 125 μ g PGF2 α analogue cloprostenol (Estrumate, Coopers animal Health Ltd., Berkhamsted, UK) 24 hr before implant removal (n=40); subcutaneous implants containing 3 mg norgestomet (Syncro-Mate-B (1/2 implant)) inserted on the back of the ear for 11 days and a single i.m injection of 125 μ g PGF2 α analogue cloprostenol 24 hr before implant removal followed by i.m. injection of 10.5 μ g synthetic GnRH (buserelin acetate, Receptal, Hoechst Roussel Vet GmbH D-65203 Wiesbaden, Germany) after implant removal by 24 hr (n=40) or no treatment (n=20). To monitor luteal activity circulating progesterone was measured using Radioimmunoassay by direct solid-phase ¹²⁵I (Coat-A-Count; Diagnostic products Corporation, Los Angeles, CA, U.S.A.). Blood samples were collected from jugular vein into vacutainer tubes at day 8 after implant removal. Blood samples were left for 3 hr at room temperature to clot and centrifuged at 3,000 rpm for 15 min; serum was separated and stored at -20°C until assayed for progesterone. Mean values (\pm standard error) were calculated and analysis of variance (ANOVA) was used for detection of significant differences using the SAS computer package [12].

During the first 72-hr period after removal of norgestomet ear implant, 31 out of 40, 34 out of 40 and 2 out of 20 does in group I, group II and control group, respectively were observed in estrus (Table 1). Goats in group II (34.41 \pm 1.45 hr, n(34) had a significantly shorter period to the onset of estrus than goats in group I (46.07 \pm 1.52 hr, n(31)

* CORRESPONDENCE TO: TAYA, K., Laboratory of Veterinary Physiology, Tokyo University of Agriculture and Technology, 3-5-8 Saiwai-cho, Fuchu, Tokyo 183-8509, Japan.

Table 1. Effect of various treatments on induction of estrus and reproductive performance of goats

Item	Treatment		
	Control	Group I	Group II
No. of animals exposed	20	40	40
No (%) of animals exhibited estrus	2 (10%)	31(77.5%)	34 (85%)
Interval from implant removal to estrus (hr)	60.0 ± 5.98 ^{a)} n=2	46.07 ± 1.52 ^{b)} n=31	34.41 ± 1.45 ^{c)} n=34
No. (%) of animals with luteal activity*	2 (10%)	24 (60%)	32 (80%)
No. of animals kidding	2	23	28**
Fertility	10.0%	57.5%	70.0%
Litter size	1.00	1.61 ± 0.14	1.75 ± 0.13
Single birth	2 (100%)	11(47.83%)	11 (39.29%)
Twin birth	–	10 (43.48%)	13 (46.43%)
Triplet birth	–	2 (8.69%)	4 (14.28%)

^{a)b)c)} Values in the same row with different superscripts differ ($p < 0.05$).

*By using progesterone analysis (higher than 1 ng/ml).

** Plus 2 goats aborted.

Animals in group I were treated with norgestomet ear implant for 11 days and PGF2 α 24 hr before implant removal.

Animals in group II were treated with norgestomet ear implant for 11 days and PGF2 α 24 hr before implant removal and GnRH 24 hr after implant removal.

Control group received no treatment.

($p < 0.05$) (Table 1) and the number of goats observed in estrus during the 72-hr after implant removal is shown in Fig. 1. Most of the blood samples (90%) collected from the control group 8 days after implant removal showed concentrations of progesterone less than 0.5 ng/ml, while 60% in group I and 80% in group II had high concentrations of progesterone that were more than 1 ng/ml, indicating luteal activity in these goats (Table1). In addition, a higher percentage of group II goats gave birth (70%) compared to group I (57.5%) but the difference was not significant (Table 1). Also, there was no significant difference between group I and group II in litter size (No. of offsprings/No. of kiddings) (Table1).

The use of norgestomet ear implants for 11 days and PGF2 α or in combination with injection of GnRH induced estrus and ovulation. The interval from implant removal to estrus was shorter in group II compared with group I. Similarly, Cardwell and coworkers found that ovulation occurred on average 70 to 80 hr after implant removal in ewes treated with norgestomet and eCG reduced the interval from implant removal to ovulation [4]. The present results are in agreement with those obtained by using other methods of treatment, for example, vaginal pessaries with flurogestone acetate followed by administration of eCG [8] or norgestomet plus eCG [3], suggesting that a single injection of GnRH may be a satisfactory substitute for eCG because eCG has a diverse effect on reproduction if used repeatedly. A higher fertility rate (No. of does kidding/No. of does exposed) in group II was indicative of more fertile matings at induced estrus, suggesting that GnRH enhanced

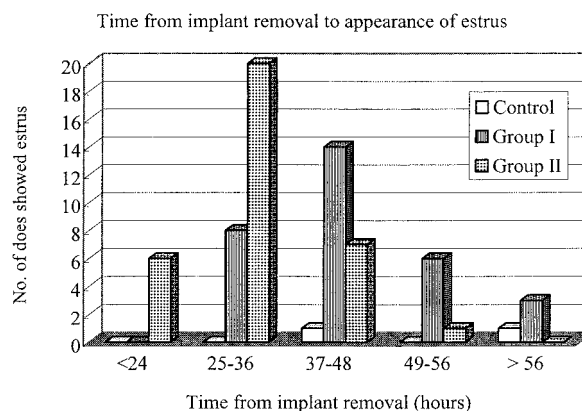


Fig. 1. Time from implant removal to the appearance of estrus in treated groups. Animals in group I were treated with norgestomet ear implant for 11 days and PGF2 α 24 hr before implant removal. Animals in group II were treated with norgestomet ear implant for 11 days and PGF2 α 24 hr before implant removal and GnRH 24 hr after implant removal. Control group received no treatment.

ovulation. In cows, injection of GnRH 24 hr after synchrono-Mate-B implant removal increased ovulation [13]. In similar study, anestrous ewes treated at different times from February through June with a 3-mg norgestomet implant for 10 days followed by an injection of 750 IU of eCG at implant removal had an average response on synchronized estrus of 72% compared with 10% for non-treated control ewes [5].

In conclusion, treatment of goats with norgestomet ear implant induced estrus during the non-breeding season and the injection of GnRH 24 hr after implant removal improved fertility rate.

REFERENCES

1. Ahmed, S., Phelps, D. A., Foote, W.D. and Foote, W.C. 1977. *Am. Soc. of Anim. Sci.* **28**: 199–201.
2. BonDurant, R.H., Darien, B.J., Munro, C.J., Stabenfeldt, G.H. and Wang, P. 1981. *J. Reprod. Fertil.* **63**: 1–9.
3. Bretzlaff, K.N. and Madrid, N. 1989. *Theriogenology* **31**: 419–423.
4. Cardwell, B.E., Fitch, G.Q. and Geisert, R.D. 1998. *J. Anim. Sci.* **76**: 2235–2238.
5. Carpenter, R.H. and Spitzer, J.C. 1981. *Theriogenology* **15**: 389.
6. Cognie, Y. 1990. pp. 207. *In: Reproductive Physiology of Merino Sheep: Concepts and Consequences*. School of Agriculture (Animal Science) (Oldham, C.M., Martin, G.M. and Purvis, I.W. eds.). Univ. of Western Australia, Nedlands, Perth.
7. Corteel, J.M. 1977. pp. 1–20. *In: Proc. Sheep Industry Development Conference*, (Terrill, C. ed.), University of Wisconsin, Madison.
8. Corteel, J.M., Gonzalez, C. and Nunes, J.F. 1982. pp. 584–601. *In: Proceedings. Third Int. Conf. Goat Production and Diseases*, Tucson.
9. Knight, C.H., Wilde, C.J., McLeod, B.J. and Haresign, W. 1988. *J. Reprod. Fertil.* **83**: 679–686.
10. Ritar, A.J., Maxwell, W.M.C. and Salamon, S. 1984. *J. Reprod. Fertil.* **72**: 559–563.
11. Roy, F., Maurel, M., Combes, B., Vaiman, D., Cribiu, E., Lantier, I., Pobel, T., Deletang, F., Combarous, Y. and Guillou, F. 1999. *Biol. Reprod.* **60**: 805–813.
12. SAS. 1987. *Statistics*, version 6.11, Cary, NC: SAS Institute Inc.
13. Troxel, T.R. and Kesler, D.J. 1984. *Theriogenology* **21**: 699–711.
14. Walkden-Brown, S.W., Restall, B.J. and Henniawati 1993. *Anim. Reprod. Sci.* **32**: 41–53.