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Effect of doses of eCG and cloprostenol on oestrus and ovulation induction in North Moroccan goats during the anoestrus season

S. El Kadili[1,2], M. Raes[2], J. Bister[2], B. Archa[1], N. Kirschvinck[2] and M. Chentouf[3]

[1]National School of Agriculture of Meknes, PB S/40, 50001 Meknes (Morocco)
[2]University of Namur, 50000 Namur (Belgium)
[3]INRA, Regional Centre of Agronomic Research, 90010Tangier (Morocco)

Abstract. This study was conducted to evaluate the effectiveness of hormonal protocols with different doses of eCG and cloprostenol in induction and synchronization of oestrus in North Moroccan goats. Thirty-two adult goats were divided into four groups adjusted for age and live weight (values??)f. Animals were treated for 11 days with an intravaginal sponge impregnated with 20 mg FGA. Two days before sponge removal, all groups received an intramuscular injection of 300 UI (T1 and T2) or 500UI (T3 and T4) of eCG plus 50 µg of cloprostenol for the T2 and T4 groups. Four fertile bucks were used to detect oestrus 12h after sponge removal and blood samples were collected every 2h from 20 to 60h following sponge removal to determine plasma LH concentrations. Oestrus and LH pic responses were similar in all groups (T1, 100%; T2, 87.5%; T3, 100%; T4, 100%). There were no statistically significant differences (P>0.05) between the groups for the onset of oestrus (26.8 ± 9.4 h, 35.6 ± 8.7 h, 21.5 ± 13h and 23.2 ± 12.7 h respectively for T1, T2, T3 and T4 groups) and preovulatory LH surge after sponge removal (36 ± 13.1 h, 37.4 ± 10.4 h, 27.2 ± 13.4h and 28 ± 9.9 h respectively for T1, T2, T3 and T4 groups). The onset of oestrus and preovulatory LH surge were significantly shorter in groups received 500UI eCG, compared to groups received 300UI (22.32 ± 12.5h vs. 30.6 ± 10h and 27.6 ± 11.4h vs. 36.7 ± 11.5h respectively; p<0.05). Dose of cloprostenol did not affect the induction and synchronization of oestrus and preovulatory LH surge (P>0.05). In conclusion, in hormonal protocols of oestrus and ovulation induction in North Moroccan goats, the utilization of 500UI eCG shortened the onset of oestrus and consequently time to inseminate in North Moroccan goats during anoestrus season. However, the protocol of progestagen treatment with 300UI of eCG can provide for a more efficient program of synchronization. With this protocol AI should be performed later estimated at 53h after sponge removal.

Keywords. Moroccan goat – Anoestrus season – Oestrus synchronization – Hormonal treatment – eCG – LH surge.

Effet de la dose d'eCG et du cloprostenol sur l'induction et la synchronisation d'oestrus et d'ovulation chez la chèvre locale du Nord du Maroc en anoestrus saisonnier

Résumé. *Cette étude a pour objectif d'évaluer l'efficacité d'un protocole hormonal testé avec différentes doses d'eCG et de cloprostenol sur l'induction et la synchronisation d'oestrus chez la chèvre locale du Nord du Maroc. Elle a porté sur 32 chèvres réparties sur 4 groupes homogènes formés en fonction d'âge et du poids corporel. Toutes les chèvres ont été traitées pendant 11j avec des éponges vaginales imprégnées de 20mg de FGA. 2 jours avant le retrait d'éponge, tous les groupes ont reçu une injection intramusculaire de 300UI (T1 et T2) ou 500 UI d'eCG (T3 et T4) avec 50 µg de cloprostenol pour les groupes T2 et T4. 4 boucs fertiles ont été introduits 12h après le retrait d'éponge pour la détection d'oestrus et des prélèvements sanguins ont été effectués chaque 2h à partir de 20h jusqu'à 60h après le retrait d'éponges pour la détermination du pic pré-ovulatoire de la LH. L'induction d'oestrus et de pic pré-ovulatoire de LH a été similaire chez tous les groupes (T1, 100%; T2, 87,5%; T3, 100% et T4, 100%). Aucun effet du traitement hormonal sur le début d'oestrus (26,8 ± 9,4 h, 35,6 ± 8,7 h, 21,5 ± 13h et 23,2 ± 12,7 h respectivement pour T1, T2, T3 et T4) et le délai de pic de LH après le retrait d'éponge (36 ± 13,1 h, 37,4 ± 10,4 h, 27,2 ± 13,4h et 28 ± 9,9 h respectivement pour T1, T2, T3 et T4) n'a été enregistré (p>0,05). Les délais de début d'oestrus et de pic de LH ont été significativement plus réduits chez les chèvres ayant reçues 500UI d'eCG en comapaison avec celles ayant reçues 300UI (22,32 ± 12,5h vs 30,6 ± 10 h et 27,6 ± 11,4h vs 36,7 ± 11,5h respectivement; p<0,05). Aucun effet du cloprostenol sur l'induction et la synchronisation d'oestrus et du pic pré-ovulatoire de LH n'a été enregistré (p>0,05).*

En conclusion, en anoetrus saisonnier, l'utilisation d'eCG à titre de 500UI réduit le délai de début d'oestrus et par conséquent le moment d'IA chez la chèvre locale du Nord du Maroc. De point de vue économique, une dose réduite de 300UI eCG est plus efficiente dans un protocol de synchronisation avec un moment d'IA décalé vers 53h après retrait d'éponge.

Mots-clés. *Chèvre locale – Nord du Maroc – Anoestrus saisonnier – Synchronisation d'oestrus – Traitement hormonal – eCG – Pic de LH.*

I – Introduction

Despite its low productivity, goat farming contributes significantly to the formation of rural population incomes in the North of Morocco (Chentouf *et al*., 2011) and therefore plays an undeniable socio-economic role. In order to improve livestock farms productivity and hence goat producers' income, a genetic improvement program of local goats is requested. The seasonality of reproduction in North Moroccan goats (Chentouf *et al*., 2011) impacts negatively on productivity and consequently on the management of animal products availability (milk and meat). In order to control reproduction and accompany a goat genetic improvement program in this region, the development of hormonal protocols to induce and synchronize oetrus during anoestrus season is necessary. Indeed, no protocol adapted to the local goat is available.

A routine synchronization protocol exists and includes the use of intravaginal progesterone sponges during 11 days combined with eCG and prostaglandin injections 48h prior to sponge removal (Leboeuf *et al*., 2000). This protocol is effective to induce synchronous oestrus and ovulation during both seasons.

The North Moroccan goat has a little size, an average of 37.5 Kg was registered in adult goat (Hilal *et al*., 2013) with an average milk production of 0.5 Kg per day (Elotmani *et al*., 2013), thus the dose of gonadotropins to be used in a progestagen protocol should be determined. Depending on milk production and season of treatment, in French breeds, Loboeuf *et al*. (2000), recommended a dose from 400 to 600 IU of eCG. Also, a dose of 50 µg of cloprostenol is recommended.

The objective of the study is to evaluate the effectiveness of hormonal protocols with different doses of eCG and cloprostenol in induction and synchronisation of oestrus and ovulation in North Moroccan goat.

II – Material and methods

1. Animals and treatments

ThirtyThirty two adult goats, exposed to natural lighting conditions, were used for the study at the experimental station of the INRA Tangier (35°N) during the anoestrus season (April). Before the start of treatment, goats were divided into four groups adjusted for age and body weight. For 11 days, the does in each group were treated with intravaginal sponges impregnated with 20 mg of Fluorogestone acetate (Chronogest CR, Intervet S.A). Two days before sponge removal, all groups received an intramuscular injection of 300 UI (T1 and T2) or 500UI (T3 and T4) of eCG (Synchro-part, Ceva) plus 50 µg of cloprostenol (Estrumate, MSD animal Health) for the T2 and T4 groups.

2. Oestrus detection

From 12h to 60h following the sponge removal does were observed for signs of oestrus with the aid of 4 fertile bucks. Each male was fitted with a marking harness. The onset of oestrus was considered as the moment when the doe showed a harness mark and stood while be mounted by the bucks.

3. Preovulatory LH surge

Blood samples were collected every 2h from 20 to 60h after sponge removal from the jugular vein using 9ml heparinized vacutainer tubes. Plasma was separated by centrifugation (2200 rpm for 20 min) and stored at -20°C until assay. LH concentrations were determined by ELISA using a commercial kit (LH Detect, Repropharm, INRA, France). LH surge was determined following the criteria of (Baird *et al*., 1981).

4. Statistical analysis

The effects of treatment (T1, T2, T3 and T4), the dose of eCG (300 or 500 UI) and necessity of cloprostenol (0, 50 µg) on the onset of oestrus and preovulatory LH surge after sponge removal were analyzed by ANOVA using Proc GLM of SAS 9.0 software.Proportions of females displaying oestrus or LH pic response were compared using chi-square test. Data were presented as mean ± SD, and the level of significance was set at $p< 0.05$.

III – Results and discussion

A summary of data regarding the induction of oestrus and ovulation by different hormonal treatments in the goats are presented in table 1. There were no significant differences ($p>0.05$) in oestrus (96.9%) and preovulatory LH surge (96.9%) responses between treatments. The mean interval from sponge removal to onset of oestrus was not significantly different ($p>0.05$) between treatments (26.8 ± 9.4 h, 35.6 ± 8.7 h, 21.5 ± 13h and 23.2 ± 12.7 h respectively for T1, T2, T3 and T4 groups). Similarly, the interval from sponge removal to preovulatory LH surge did not differ significantly between T1 (36.0 ± 13.1), T2 (37.5 ± 10.4), T3 (27.2 ± 13.4) and T4 (28.0 ± 9.9) groups, respectively.

The present study shows that North Moroccan goat respond adequately to synchronization of oestrus by intravaginal sponges of progestagen treatment. These findings for inducing and synchronizing oestrus and ovulation are in agreement with the others (Freitas *et al*., 1996; Leboeuf *et al*., 2003; Zarazaga *et al*., 2014; Rekik *et al*., 2014). In a previous study, Baril *et al*. (1993) reported an onset of oestrus that start from 24 to 72h after sponge removal. These authors used 45mg FGA. These higher doses of FGA could have promoted an hormonal latency, which could have delayed the onset of oestrus.

Table 1. Influence of hormonal treatments on oestrus and LH pic response and mean interval to onset of oestrus and preovulatory LH surge after sponge removal during the anoestrus season

Treatment groups	Oestrus response (%)	LH pic response (%)	Onset of oestrus after sponge removal (h)	Preovulatory LH surge after sponge removal (h)
T1 (n = 8)	100	100	26.8 ± 9.4	36.0 ± 13.1
T2 (n = 8)	87.5	87.5	35.6 ± 8.7	37.5 ± 10.4
T3 (n = 8)	100	100	21.5 ± 13.0	27.2 ± 13.4
T4 (n = 8)	100	100	23.2 ± 12.7	28.0 ± 9.9
Significance	*NS*	*NS*	*NS*	*NS*

NS: P> 0.05.

Following sponge removal, it was determined that among the groups administered with different doses of eCG, the onset of oestrus (Fig. 1) was shorter in 500UI eCG groups (22.3 ± 12.5h) compared to 300UI eCG groups (30.6 ± 10.0 h; $p<0.05$). Likewise, the mean interval from sponge removal to preovulatory LH surge (Fig. 2) was shorter in 500UI eCG groups (27.6 ± 11.4 h) compared to 300UI eCG groups (36.7 ± 11.5h; $p<0.05$). These results are in agreement with those of Oliv-

era *et al*. (2001), Ali (2007) and Nasroallah and Nemat (2012). As we know, eCG treatment is required to induce oestrus in goats during the anoestrus season (Bosu *et al*., 1978) by the way that it acts like FSH (Follicule Stimulating Hormone) which shortens the interval from progestagen treatment cessation to the onset of oestrus. The injection of a high dose of eCG can stimulate his action on follicular growth by fasting the development, which in turn is caused by a greater production of estrogen (Wildeus, 2000). Consequently, after sponge removal, the times to the onset of oestrus and preovulatory LH surge were shorter in goats synchronized with the high dose of eCG (500UI). Thus, the optimal moment for AI when 500UI of eCG was used is 43h after sponge removal if we estimated an ovulation at 24h after preovulatory LH surge (Fatet *et al*., 2011). In French protocols, cervical inseminations are performed 43h after sponge removal with a time of ovulation estimated as 52h after sponge removal (Leboeuf *et al*., 1998). This report is similar to our findings with a dose of 500UI eCG. With the lower dose of eCG (300UI), preovulatory LH surge was induced at 36.7h after sponge removal. Therefore, insemination can be performed at 53h after sponge removal suggesting an ovulation at 61h after sponge removal.

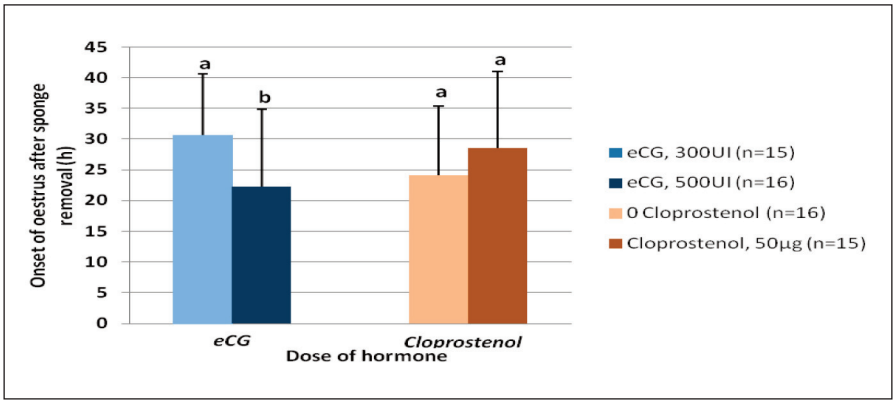

Fig. 1. Effects of doses of eCG and cloprostenol in the time of onset of oestrus after sponge removal in the North Moroccan goats during the anoestrus season.

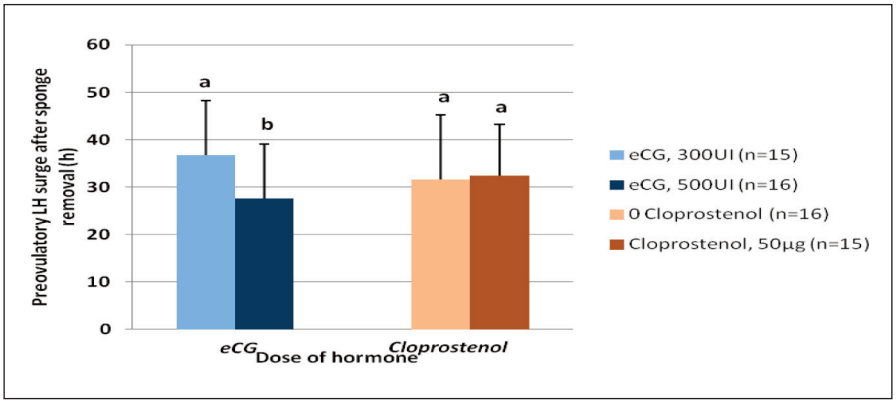

Fig. 2. Effects of doses of eCG and cloprostenol in the time of the preovulatory LH surge after sponge removal in the North Moroccan goats during the anoestrus season.

Dose of cloprostenol did not influence the induction and synchronization of oestrus and preovulatory LH surge in goats (fig. 1 and fig. 2; P>0.05) indicating that as reported by Baril *et al*. (1993) prostaglandine is effective for synchronization only when a persistent corpus luteum is present at the time of treatment. Therefore, it's suitable only for synchronization during the breeding season (Ahmed *et al*., 1998; Greyling and Van der Nest, 2000; Motlomelo *et al*., 2002). Injection of prostaglandin after sponge removal causes a corpus luteum luteolysis and synchronize oestrus in the herd.

IV – Conclusions

The results of this study suggest that in hormonal protocols of oestrus and ovulation induction in North Moroccan goats, the utilization of 500UI eCG shortened the onset of oestrus and consequently time to inseminate in goats during anoestrus season.

Moreover, the protocol of progestagen treatment with 300UI of eCG can provide for a more efficient program of synchronization. With this protocol AI should be performed later at 53h after sponge removal.

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