



## Induction of estrus in Sahel goats using Fluorogestone Acetate (FGA) sponges and Equine Chorionic Gonadotrophin (ECG)

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### Abstract

The objective of the present study was to evaluate the effect of a progestagen treatment alone or in combination with equine chorionic gonadotrophin (eCG) on estrus response in Sahel (SH) goats. One hundred (n=100) SH does were treated with 30 mg fluorogestone acetate (FGA) sponge for 14 days. At the end progestagen treatment, does that retained the intravaginal pessary were allocated into two groups; A: FGA & eCG (n=42) and B: FGA (n=41). Does in group A received additional 200 IU eCG i.m. concurrent with sponge removal. Estrus was detected twice daily (at 07.00 – 10.00 and 15.00 – 18.00 h) using sexually active bucks for 5 days after pessary removal. Estrus response was different ( $p<0.05$ ) between A (73.8 %) and B (58.5 %). Estrus onset for group A and B (Mean  $\pm$  S.E.M.) was  $27.9 \pm 8.3$  and  $38.4 \pm 9.6$  h while estrus duration (Mean  $\pm$  S.E.M.) for group A and B was  $35.8 \pm 3.2$  and  $23.1 \pm 5.2$  h, respectively. Estrus onset and duration of estrus were different ( $p<0.05$ ) between group A (FGA & eCG) and B (FGA). It is concluded that additional eCG treatment following a 14-day progestagen (Fluorogestone acetate) treatment increased estrus response, hastened onset of estrus, lengthened duration of estrus and improved tightness of synchrony in Sahel does.

**Keywords:** eCG, estrus synchronization, fluorogestone acetate, Sahel goats, sponges.

### Introduction

In Nigeria, goats play an important role in income generation to farmers. Several methods have been developed to induce estrus in goats allowing farmers to raise and provide kids to meet market demands for meat and milk (Abecia *et al.*, 2011). Estrus synchronization enables kidding over a limited period thereby allowing producers to give optimum care for the mothers and kids and in turn reduce kid mortality (Whitley & Jackson, 2004). Importantly, producers are able to breed their goats so they can kid at the time of the year when pasture is more abundant. Intravaginal devices containing natural and synthetic types of progestagens, maintained in situ during 14–21 days, associated with gonadotrophin administration is the most widely used (Abecia *et al.*, 2012).

The Sahel breed of goat is one of potential livestock to be developed. The Sahel goat is found along the semi-arid zones or Northern borders of Nigeria, particularly in Borno (Maina *et al.*, 2006; Igboke *et al.*, 2009). They are long-legged with good adaptation to this arid environment (Igboke *et al.*, 2009). However, there is a dearth of information on their response following estrus synchronization. The application of reproductive technologies enables improvement in the reproductive performance of goats. High reproductive performance is essential for profit in goat meat production and is determined by the number of progeny delivered in a given time (Ezekwe & Lovin, 1997).

The use of intravaginal progestagens followed by pregnant mare's serum gonadotrophin (PMSG) injection to synchronize estrus during the normal

breeding season (Menegatos *et al.*, 1995), to induce estrus out of season (Karatzas *et al.*, 1997), and to improve ovulation rate (Greyling & Van Niekerk, 1990; Pendleton *et al.*, 1992; Omontese, 2012) has been reported. However, the additional use of eCG attracts more input cost to the producer. Knowledge of the rate of estrus response, time of initiation and duration of estrus after estrus synchronization using progestagen treatment alone or in combination with eCG is important to develop a simple, pragmatic and reliable protocol that can be adopted by farmers. The objective of this study was to evaluate the effect of fluorogestone acetate sponge alone or in combination with eCG on estrus response in Sahel goats.

## Materials and methods

### Location, Housing and Management

This experiment was conducted at the goat pen of the Small Ruminant Research Programme (SRRP), National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Zaria, Nigeria from January – February (Hot dry season). NAPRI is located in the Northern Guinea Savannah zone of Nigeria between latitude 11 °N and 12 °N and between longitude 7 °E and 8 °E at an elevation of 650 m above sea level with an average annual maximum and minimum temperature of 31.0 ± 3.2 °C and 18.0 ± 3.7 °C respectively. Shika has an average annual rainfall of 1100 mm usually lasting from May to October with a mean relative humidity of 72 % while the dry season lasts from November to April with mean daily temperatures ranging from 15 – 36 °C and mean relative humidity of between 20 – 37 %. Does were housed in pens and allowed to graze improved sown pasture (*Digitaria*) within large paddocks. The does were also fed *Digitaria smutsii* (wooly finger grass) hay; concentrate supplement (0.5 kg/day), and water provided *ad libitum*.

### Animals and hormonal treatment

One hundred (n=100) apparently healthy and cycling Sahel does weighing 16.3 ± 3.8 with body condition scores (BCS, range 1 – 5; Spahr, 2005) 2.5 – 3.5, aged between 2 – 3 years and that had shown at least two estrus cycles (19-21 days) were used for this study. Does were treated with Fluorogestone acetate intravaginal sponge (Pharmplex, Australia) for 14 days by introducing the sponge into the anterior portion of the vagina using a sponge applicator. At end of the progestagen treatment, retention rate was evaluated by counting the number of does that still had the intravaginal sponge in place. Does that

retained the sponges were allocated into two groups A: FGA & eCG (n=42) and B: FGA (n=41). Group A received a single intramuscular injection of 200 IU equine chorionic gonadotrophin (PMSG-Intervet, Ireland) concurrent with progestagen withdrawal while group B received nothing.

### Estrus detection

Does were placed with sexually experienced Sahel bucks in the ratio of 1 buck to 10 does. Does were observed visually for behavioral estrus manifestation twice (0700-1000 and 1500-1800 hours) daily for 5 days after sponge withdrawal. Standing to be mounted was used to determine estrus response. Mounted does were allowed to run with the other does in the group. Estrus activity occurring within 5 days (120 hours) of removal of sponges was classified as synchronized. Estrus response, time interval to initiation of estrus and duration of estrus were evaluated. Estrus Response was calculated as the number of does that showed standing estrus and subsequently mated, over the total number of does in each treatment group, expressed as a percentage. Time to initiation of estrus was evaluated as the time (hours) interval from when the progestagen was removed to the time when the doe first expressed standing estrus (heat) after being exposed to the buck expressed as mean ± standard error of mean (S.E.M.) while duration of estrus was measured as the time (hours) between the first and last standing estrus expressed as the mean ± standard error of mean (S.E.M.).

### Statistical analysis

Retention and estrus response rates were expressed in percentages. Data on estrus response, time to initiation of estrus and estrus duration were analyzed using SPSS 17.0. Student t- test was used to compare means between treatment groups. Values of p< 0.05 were considered significant.

## Results

At the end of 14 days treatment, retention rate was 83 % (83/100). Estrus response was higher (p<0.05) in group A than B (31/42 [73.8 %] and (24/41 [58.5 %]) (Table 1), respectively. Time to initiation of estrus was shorter (p<0.05) in group A (27.9 ± 8.3 h) than group B (38.4 ± 9.6 h) (Table 1). Estrus duration was longer (p<0.05) in group A than group B does (35.8 ± 3.2 and 23.1 ± 5.2 h) (Table 1), respectively. More Sahel does were in estrus within the 3 days following progestagen removal in group A (84 %)

than in group B (67 %) (Figure 1).

**Table 1:** Estrus properties of Sahel goats following estrus synchronization using Fluorogestone acetate (FGA) and equine chorionic gonadotrophin (eCG)

Estrus properties	Sahel does	
	A: FGA & eCG (n=42)	B: FGA (n=41)
Estrus response (%)	73.8 <sup>a</sup> (31/42)	58.5 <sup>a</sup> (24/41)
Time to onset of estrus (h)	27.9 ± 8.3 <sup>a</sup>	38.4 ± 9.6 <sup>a</sup>
Duration of estrus (h)	35.8 ± 3.2 <sup>a</sup>	23.1 ± 5.2 <sup>a</sup>

Key

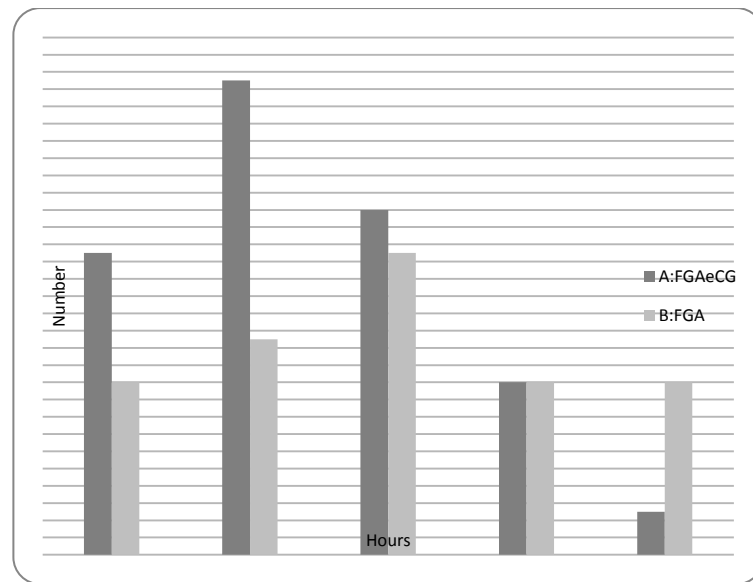
% = Percentage

FGA = FGA-30<sup>®</sup> sponge

eCG= equine chorionic gonadotrophin

n= Number of does treated with progestagen

<sup>a</sup>Mean values along the same row with same superscripts alphabets are statistically different (p<0.05).



**Figure 1:** Tightness of synchrony of Sahel does following 14-day progestagen treatment alone (B: FGA) or in combination with eCG (A: FGA & eCG).

## Discussion

The retention rate (83 %) obtained in this study is less than the 89.9 % and 100 % reported by Omontese *et al.* (2010) in prepartum Red Sokoto does treated with CIDR and fluorogestone acetate sponges, respectively. It is also less than the 100 % reported by Romano (1996) in dairy goats treated with FGA. Factors such as management system (Omontese, 2012), intravaginal sponge texture and consistency (Alifakiotis *et al.*, 1982) and techniques employed in inserting sponge (Romano, 1998) have been reported to influence sponge retention in the vagina. Estrus response was significantly higher in group A (73.8 %) than B (58.5 %). This indicates that administration of eCG in group A (concurrent with

sponge withdrawal) seemed able to stimulate more does to commence estrus. The 73.8 % obtained in Sahel does treated FGA intravaginal sponge and eCG is less than the 88 % reported by Pendleton *et al.* (1992) in anoestrus dairy goats treated with FGA sponge, the 100 % recorded for Saanen and Nubian goats (Regueiro *et al.*, 1999) and the 87 % (Fonseca *et al.*, 2005) for Toggenburg goats. On the other hand, the estrus response in group B (58.5 %) obtained in this study is higher than the 20 % obtained by Omontese *et al.* (2010) in prepartum Red Sokoto does treated with FGA alone for 21 days and the 73.5 % reported by Greyling & Van der Nest (2000) using intravaginal MAP progestagen

sponges. This variation may be due to effect of age and parity, breed, nutrition, treatment protocol, location, management and climate (Mani *et al.*, 1992; Romano, 2002; Evans *et al.*, 2004). In the present study, most does in group A exhibited estrus earlier ( $p < 0.05$ ) and mostly within the first 72 hours after sponge withdrawal, while does in group B showed estrus behavior much later (Table 1). Group A (FGA & eCG) exhibited better tightness of synchrony with 83 % of does in estrus by day 3 (Figure 1). This is less than the 88.9 % reported by Omontese (2012) in Sahel does treated with FGA for 15 days in combination with the intramuscular injection of 400 IU eCG concurrent with sponge withdrawal. Estrus onset was hastened ( $p < 0.05$ ) in group A ( $27.9 \pm 8.3$  h) than in group B ( $38.4 \pm 9.6$  h). The time to estrus onset in group A ( $27.9 \pm 8.3$  h) is less than the  $32.6 \pm 19.5$  h reported by Romano (1998) in Nubian goats treated with FGA. It is also less than the  $45.3 \pm 13.5$  h reported by Romano (2002) in Nubian goats treated with FGA-sponge but similar to the  $27.2 \pm 11.2$  h reported by Fonseca *et al.* (2005) in Toggenburg goats treated with medroxyprogesterone acetate sponges + eCG. Ungerfeld (2011) has reported that the introduction of vasectomised rams and bucks (Romano, 1998) in an estrus synchronization protocol using prostaglandin or progestagens hastens the onset of induced estrus.

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There was significantly longer estrus duration (Mean  $\pm$  S.E.M.) in group A ( $35.8 \pm 3.2$  h) than group B ( $23.1 \pm 5.2$  h) (Table 1). Mori & Kano (1984), and Greyling & Van Niekrek (1990) reported that synchronization with PGF<sub>2 $\alpha$</sub>  or administration of progestagen together with PMSG lengthens estrus duration by about 6 h compared with natural cycles. Such elongation of estrus was observed in does in group A. It is reported that that the mean duration for standing estrus varies between animals and from one estrus to another (Akusu & Egbunike, 1990; Teleb *et al.*, 2003) and may be influenced by number of services (Romano & Fernandez Abella, 1997). On the other hand, Hafez (1993) reported that duration of estrus is species-dependent and varies slightly from one female to another, within the same species.

In conclusion, overall, it was concluded that a 14-day fluorogestone acetate sponge treatment alone is capable of synchronizing estrus in Sahel goats but the additional administration of eCG increases estrus response, shortens time to onset of estrus, lengthens the duration of estrus and tightens estrus synchrony in Sahel does.

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