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Synchronization of Estrus Using EAZI-Breed™ CIDR® and FGA-30® Intravaginal Sponge in Pre-Partum Yankasa Ewes

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Abstract: The efficiency of EAZI-Breed™ CIDR® and FGA-30® intravaginal sponges in synchronizing estrus was investigated in prepartum Yankasa Ewes. About 20 randomly cycling pre-partum Yankasa ewes aged between 1.5-2 years and weighing between 13-15 kg was used for this study. They were randomly assigned into two groups, Group A (FGA, n = 10) and Group B (CIDR®, n = 10) for 14 days. Natural mating by a fertile ram was performed following progestagen withdrawal for ewes detected to be on heat. Estrus response in Group A and B was 70 and 80%, respectively. The time to estrus onset following progestagen withdrawal for FGA-30 and CIDR (Mean±SEM) was 43.60±6.98 and 23.57±4.07 h, respectively. In Groups A and B, the duration of induced estrus was (46.65±3.08 and 53.90±5.87 h) while estrus cessation was (90.37±8.44 and 77.92±4.24 h) post withdrawal of the devices. The interval from withdrawal of progestagen to onset of estrus was ($p<0.05$) longer in FGA than in CIDR (43.60±6.98 vs. 23.57±4.07 h). However, the duration of induced estrus period was shorter in the FGA group than the CIDR group. Retention rate was lower in group A (60%) than B (90%). Drawstring breakage observed in FGA sponges was absent in CIDR devices (20% versus 0) while vaginal discharge rate was higher in group A. These results show that although FGA and CIDR devices are equally efficient in synchronizing estrus in prepartum Yankasa ewes, CIDR provides higher estrus response rate, shorter time to estrus, longer duration of estrus, higher retention rate and ease of application. Consequently, the use of CIDR is recommended.

Key words: CIDR, FGA-30, estrus response, sheep, progestagen, randomly assigned

INTRODUCTION

There is a pressing need to increase the production of domestic animals such as the small ruminants which are conventional sources of animal protein. This is to overcome the acute shortage of animal protein in the diet of the average Nigerian (Shaib *et al*., 1997). Many Nigerians consume <10 g of animal protein daily, against the minimum of 28 g day^{-1} for a balanced diet (Ibe, 2004) because of the high cost. Small ruminants have been reported to form an integral part of the cultural life and system of Nigeria's peasantry (Ajala, 2004). There is abundant literature on the influence of season on the reproduction of domestic animals (Rekwot *et al*., 1987). However, there's a dearth of research studies on the reproductive performance of sheep indigenous to the tropics induced by hormonal treatments. Treatment of ewes with intravaginal sponge impregnated with progestagen Flurogestone acetate, FGA or intravaginal device containing progesterone (Controlled Intravaginal Drug Release, CIDR), for a period of 10-16 days and intramuscular injection of eCG at intravaginal device removal have been successfully used to improve the reproductive performance (Kohno *et al*., 2005). Ovarian response of sheep to estrus synchronization varies with stress, environment, season and the kind of progestagen employed (Menegatos *et al*., 2003; Evans *et al*., 2004).

Yankasa sheep is the most widespread breed of sheep northern Nigeria. Their propensity to carry and raise offspring, coupled with the fact that they can breed all year round makes them suitable candidates for increasing the much needed proteins for Nigeria's teeming population. There is a dearth of information regarding estrus synchronization efficiency in this breed induced by

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hormonal treatment. Thus, the aim of this study was to determine the effectiveness of EAZI-Bread™ CIDR® and FGA-30® vaginal sponge in synchronizing estrus in prepartum Yankasa ewes.

MATERIALS AND METHODS

Location: The study was carried out at the Small Ruminant Research Programme of the National Animal Production Research Institute (NAPRI), Shika-Zaria, Northern Nigeria, latitude 11°12'N and longitude 7°37'E between June and August, 2009. An average annual maximum and minimum temperature of 31.8+3.2°C and 18.0+3.7°C, respectively characterize the climate of the area. The monthly average rainfall during the rainy season (May-October) is 148.1+68.4 mm (69.2-231.9 mm).

Experimental ewes and herd management: About 20 randomly cycling pre-partum Yankasa ewes aged between 1.5-2 years and weighing between 13-15 kg were used for this study. During the experiment, they were confined in two separate pens (per treatment group) and maintained intensively on *Digitaria smutsii* (wooly finger grass) hay; concentrate supplement (0.5 kg day^{-1}) was given and water was provided *ad libitum*. The animals were individually identified by means of plastic ear tags. Before the experiment, all the animals were not pregnant since proper record of their estrous cycle activities were kept.

Synchronization of estrus: The animals were randomly distributed into two treatment groups as follows: Group A-consisting of ten Yankasa ewes treated with FGA-30® Vaginal Sponge. These are polyurethane sponges impregnated with 30 mg flurogesterone acetate which is a potent progestin that prolongs the diestrus stage of the reproductive cycle allowing synchronization of the breeding cycle. Group B -consisting of ten Yankasa ewes treated with EAZI-breed™ CIDR®, an inert silicone elastomer impregnated with 0.3 g natural progesterone.

Insertion and removal of devices (EAZI-Breed™ CIDR® and FGA-30® Sponge): In Group A, FGA-30® vaginal sponge was inserted into the vagina of each ewe with the aid of an applicator. The applicator was disinfected with chlorhexidine, lubricated using glycerol and with a gloved hand inserted into the vagina. The applicator plunger was pushed gently to eject the sponge ensuring that the drawstring was still hanging outside the vagina. In Group B, EAZI-Breed™ CIDR® device was inserted into the vagina of each ewe with the aid of the device applicator. After loading the applicator, the tip was lubricated with glycerol and then inserted through the vulva into the vagina. The applicator plunger was pressed to release the device, leaving the cord protruding from the vulva. The devices (FGA vaginal sponge and EAZI-Breed™ CIDR®) were allowed in place for 14 days after which they were removed by pulling the removal cord/draw-string.

Estrus detection: Following removal of the devices, the ewes were observed visually for behavioral estrus manifestation two times (0800-1100; 1500-1800) daily for 5 days. Standing to be mounted by other females (homosexual mounting) and mounting by the males (heterosexual mounting) was taken to be the primary and sole criteria to judge evidence of estrus. Estrus periods occurring within 72 h post removal of devices were classified as synchronized. A ratio of one ram to ten ewes (Abiodun, 1998) was made to ensure adequate detection of heat by the rams. Ewes observed to be on standing heat were noted and naturally mated.

Estrus behaviour and efficacy of progestagens: The following estrus behavior and device/sponge properties were calculated:

Estrus response (%): The number of ewes that show standing estrus and subsequently mated to the total number of ewes in each treatment group, expressed in percentage.

Time to onset of estrus: This was measured by recording the time (h) interval from when the devices/sponge were removed to the time when the ewe first expressed standing estrus (heat) after being exposed to the ram expressed as Mean+Standard Error of Mean (SEM).

Duration of estrus: The duration in hours expressed as the Mean+Standard Error of Mean (SEM) between the first standing estrus and the last time of allowing mounting by the ram.

Time to cessation of estrus: This was measured by recording the time (h) interval from when the devices/sponge were removed to the time when the ewe finally expressed standing estrus (heat) after being exposed to the ram expressed as mean+Standard Error of Mean (SEM).

Retention rate (%): This was measured by the number of ewes that retained the intravaginal sponges or device to the total number in each treatment group for the period of the experiment without voiding it expressed in percentage.

Vaginal discharge rate (%): This was measured by the number of ewes that showed vaginal discharges on removal of the device or sponge to the total number in each treatment group that retained the device/sponge expressed in percentage.

Draw-string breakage rate (%): This was measured by the number of the devices or sponge that firmly adhered to the vaginal mucosa resulting in fracture of the draw-string during removal necessitating the use of external aid to remove device/sponge to the number in each treatment group that retained the device/sponge, expressed in percentage.

Statistical analysis: The following variables (estrus response, device/sponge retention, vaginal discharge, draw-string breakage) were expressed in percentages. Data on time to onset of estrus, duration of estrus and cessation of estrus were analyzed using the independent t-test. The 95% significance level was noted. The SPSS-11.0 software was used for all statistical analyses.

RESULTS AND DISCUSSION

The time to onset of estrus, time to cessation of estrus duration of estrus, estrus response, retention rates, vaginal discharge rate and draw-string breakage rates after progestagen removal are summarized (Table 1). Time to onset of estrus, duration of estrus, estrus response, retention, vaginal discharge, drawstring breakage rates were 43.60±6.98 and 46.65±3.08 h, 70, 60, 100 and 20% and 23.57±4.07 and 53.90±5.87 h, 80, 90, 70 and 0% in groups A and B, respectively. No significant difference in terms of estrus response and duration of induced estrus was recorded between FGA and CIDR (80%, 46.65±3.08 h versus 70%, 53.90±5.87 h).

Time to estrus onset was shorter in the group that received CIDR (23.57±4.07 h) than FGA (43.60±6.98 h). Group B had a higher retention rate than group A discharge rate differ significantly, ($p<0.05$) while draw-string breakage was absent in B. There was no significant difference ($p>0.05$) between treatments in terms of duration of estrus and estrus response rate. However, time to estrus onset, retention rate and vaginal discharge rate differ significantly, ($p<0.05$).

The results of the present study clearly demonstrate the co-effectiveness of the two regimes used to synchronize estrus in Yankasa ewes. Although, not much research has been done using FGA-30® and EAZI-Breed™ CIDR® in sheep in Nigeria, the estrus responses obtained in Groups A and B is similar to findings of previous research that also used same progestagens (Holst and Moore, 1970; Ola and Egbunike, 2005). In this study, higher estrus response of 80% was recorded in group B (CIDR) than the 70% in group A (FGA). On the contrary, Knight and Hall (1988) cited the estrus response following CIDR removal to be significantly lower than obtained following sponge treatment (87 vs. 94%). This was however, related to higher loss of CIDRs, compared to sponges (63 vs. 0.8%).

Table 1: Summary of estrus synchronization in Ewes

Treatment group	A (FGA)	B (CIDR)
No. of ewes (n)	10	10
Estrus onset (h), Mean+SEM	43.60±6.98	23.57±4.07
Estrus cessation (h), Mean+SEM	90.37±8.44	77.92±4.24
Estrus duration (h), Mean+SEM	46.65±3.08	53.90±5.87
Response rate (%)	70	80
Retention rate (%)	60	90
Vaginal discharge rate (%)	100	70
Draw-string breakage rate (%)	20	0

h = Hours, n = Number, SEM = Standard Error of Mean

This is not in agreement with the observations in this experiment where there was a higher loss of sponges compared to CIDR (40 vs. 10%). In the present study, the overall estrous response in ewes using CIDR device without intramuscular administration of PMSG at device removal was 80% which is lower than the 93.3% obtained by Hashemi *et al.* (2006) in Karakul ewes.

This is probably due to the estrus enhancing effect of administration of gonadotrophin at progestagen removal. The differences reported by different researchers on estrus response rate can be explained by the differences in body condition, breed and management, although many factors (type of intravaginal device, dose and timing of eCG injection, breed and age of ewes/does, season and others) affect fertility, synchronized estrus and ovulation.

In this study, the mean interval to onset of estrus following progestagen withdrawal was about 34 h and was significantly different between the FGA and CIDR group (Fig. 1). This was shorter than that reported by Dogan *et al.* (2004). Researchers have reported the onset of estrus to occur within 6-120 h following progestagen removal (Romano, 1998; Greyling and Van der Nest, 2000). These differences may be explained by variation in breed, lactation, nutrition, season, use of gonadotropins and presence of males after progestagen removal

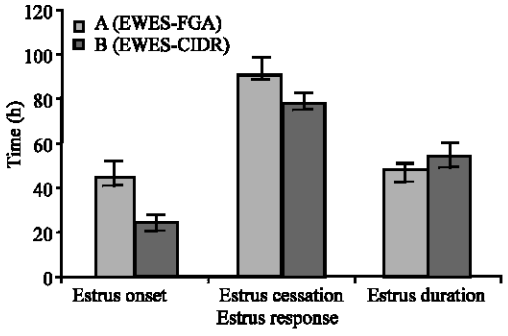

Fig. 1: Summary of astrus synchronization, where: Group A = Ewes treated with FGA-30® vaginal sponge, Group B = Ewes treated with EAZI-breed™ CIDR®

(Muna *et al.*, 1998; Romano, 1998, 2002). The duration of estrus was longer in group B (53.90±5.87 h) than in group A (46.65±3.08 h). The range of 40.00-72.00 h reported in the present study agrees with previous research reports (Ola and Egbunike, 2005), although slightly higher. Retention rate was higher in animals treated with EAZI-Breed™ CIDR® than FGA-30® vaginal sponge. This is contrary to observations by Romano (1996) who observed a hundred percent retention rate for both CIDR and FGA sponges throughout the period of the experiment. Other researchers have reported a high number of CIDR losses in ewes (Maxwell and Barnes, 1986; Rhodes and Nathaniel, 1988).

This contradicts the result in this experiment. Previous experience with the use of CIDR in ewes, techniques employed in inserting the sponge (Romano, 1998) and factors such as intravaginal sponge texture and consistency could influence sponge retention in the vagina (Alifakiotist *et al.*, 1982). In addition, a disadvantage described by Greyling and Brink (1987) while using CIDRs dispensers, i.e. difficult insertion was not observed in the present study.

At the time of progestagen removal, the appearance of vaginal discharge was investigated. Every member of Groups A and C (Sponge treatment) expelled foul-smelly straw-coloured vaginal discharge (>3 mLs each) on removal of the sponge after the period of treatment unlike the volume (<1 mL^{-1}) of discharge obtained in fewer members of Groups B (CIDR treatment) that was less foul-smelly. Amir and Ali (2006) reported that majority of ewes that received CIDR (17/19) and sponge (14/14) had vaginal discharges at the time of device removal. This is similar to the findings of this experiment where Groups A and B had (10/10) and (7/10) vaginal discharge, respectively.

Draw-string breakage was present in Group A (20%). This was however absent in the CIDR treated Groups B. This made the removal of CIDR easier and less cumbersome.

Sponges were found to adhere very tightly to the vaginal mucosa making withdrawal quite difficult. This predisposed the draw-strings in sponges to breakages when being pulled during removal at the end of the treatment period. On the contrary, removal of CIDR® device was easier as such adhesions as seen in sponges to the vaginal mucosa was absent. This accounts for the draw-string breakage rate in sponges. In each case where this incident occurred, a tissue forceps was skillfully and carefully employed to remove the retained sponge piece.

CONCLUSION

In conclusion, the results of present study indicate that the source of progestin affects the estrous response (CIDR® vs. FGA®), Withdrawal of intravaginal devices resulted in high drawstring breakage in FGA sponges when compared to CIDR devices, Estrus response was higher and time to onset of estrus was shorter and duration of estrus was longer in the groups treated with CIDR (Group B) compared to those administered FGA-30® vaginal sponge (Group A).

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