

*Full Length Research Paper*

## **Effect of exogenous progesterone on oestrus response of West African Dwarf (WAD) goats**

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**Twenty-four (24) healthy, parous West African dwarf (WAD) does aged 2 – 3 years were used to study the effects of varying doses of progesterone on oestrus synchronization and plasma progesterone levels. The does were randomly assigned to 4 treatment groups consisting of 12.5, 25.0 and 37.5 mg progesterone treatments and 1.0 ml physiological saline as the control. The animals were monitored for signs of oestrus during and after the treatment. Blood samples collection from each treatment groups on days 7 and 14 of progesterone treatment were used for serum progesterone evaluation. The results showed that the number of oestrus goats, percentage oestrus goats and oestrous cycle length were similar between the control and goats on 12.5 mg progesterone injection. The does treated with 12.5 mg progesterone showed longer oestrus duration that differed significantly ( $P < 0.05$ ) from goats on 25.0 and 37.5 mg progesterone and the control treatment. There was no significant difference ( $P > 0.05$ ) in intensity of heat between the treatment groups. Although higher serum progesterone levels were observed in goats treated with 37.5 mg progesterone, 12.5 mg was more effective in producing heat at the withdrawal of progesterone treatment. The results of this study indicate that progesterone injection would be effective in synchronizing heat in WAD goats.**

**Key words:** Goats, oestrus, synchronization, progesterone.

### **INTRODUCTION**

Oestrus detection in the female animals is time consuming, laborious and subject to human error (Britt, 1984; Webel and Day, 1982). Synchronization of oestrus and ovulation in a group of females allows one to predict the time of oestrus with reasonable accuracy and minimizes the time and difficulty involved in detecting oestrus. (Smith, 1982). Oestrus synchronization and ovulation requires the manipulation of luteal and follicular phases of the oestrus cycle. Oftentimes, this is achieved in farm animals when the luteal phase is shortened by premature luteolysis of functional corpora lutea or the phase is extended by suppressing follicular growth.

A number of workers have administered progestagens in cyclic female goats with satisfactory results

(Zaimfirescu and Sonea, 2000; Freitas et al., 2004; Paula et al., 2005). These researchers reported that whatever is the stage of the cycle, if the treatment starts at the same time in each female of a group and lasts for a long enough period of time, most animals of the group will be in heat within a few days from the end of treatment provided the treatment also ends in all animals at the same time. The use of progestagens in improving fertility, pregnancy and kidding rates will continue to be a viable option in reproductive management of goats (Chemineau et al., 1999; Sahlu and Goetsch, 2005). Although, the developing regions have more goat populations, there are more researches on goat reproduction and management in developed countries. Also, there is paucity of information on the use of progestagens in oestrus synchronization in West African dwarf goats. This study was therefore carried out to investigate the use of progesterone injections in West African dwarf goats.

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**Table 1.** Effect of progesterone injections on oestrus synchronization of West African dwarf goats.

Parameter	Progesterone treatment (mg)			
	1.0 ml (Control saline)	12.5	25.0	37.5
No. of treated goats	6	6	6	6
No. of oestrus goats	5 <sup>a</sup>	4 <sup>a</sup>	2 <sup>b</sup>	1 <sup>c</sup>
Percentage oestrus goats	83.38 ± 2.89 <sup>a</sup>	66.66 ± 0.46 <sup>a</sup>	33.33 ± 1.04 <sup>b</sup>	36.66 ± 0.70 <sup>b</sup>
Duration of oestrus (h)	40.35 ± 0.14 <sup>a</sup>	30.25 ± 0.25 <sup>a</sup>	19.6 ± 0.92 <sup>b</sup>	19.0 ± 0.25 <sup>b</sup>
Estrous cycle length(days)	20.2 ± 0.51 <sup>a</sup>	19.6 ± 0.92 <sup>a</sup>	19.5 ± 0.25 <sup>a</sup>	18.5 ± 0.25 <sup>b</sup>
Intensity of heat (%)	73.33 ± 2.33	68.42 ± 1.56	66.7 ± 1.04	63.2 ± 1.05

a' b' c: Means within row with different superscripts are significantly different (P < 0.05).

## MATERIALS AND METHODS

### Experimental animals

Twenty-four (24) sexually mature clinically sound parous West African Dwarf (WAD) does and 3 WAD bucks 2 – 3 years-old were used in this study. A two-week pre-experimental period was allowed to enable the animals to adjust to the new environment. The animals used were those that showed good records from their source, including evidence of good health and excellent mothering ability. The animals were identified with numbered wooden tags.

The animals were housed in separate pens constructed in such a way that the goats could come outside during the day for access to sunlight and forage. Routine inspection for cleaning was carried out. Fresh grasses were the major source of feed. Brewer's dry grains (BDG) were used as supplement. The animals were fed twice daily (mornings and evenings). Salt lick was provided as mineral supplement. Water was given liberally to the animals.

### Experimental design

The does were randomly divided into four treatment groups of six animals per group; each group was further divided into 3 replicates of 2 animals per replicate. Each animal in the replicate was randomly assigned to intramuscular progesterone injections at 12.5, 25.0, 37.5 mg and 1.0 ml physiological saline as the control treatment. These treatments were given every 24 h for 14 days. The animals were monitored for signs of oestrus during and after the treatment. Animals that showed signs of heat were observed closely and events were recorded.

### Oestrus detection

Immediately, after removing the progesterone treatment on day 9 of post synchronization, a matured aproned buck was used for oestrus ('heat') detection. Heat detection was done twice daily for 1 h at 9.00 – 10.00 am and 5.00 – 6.00 pm. The process of heat detection was carried out for 3 consecutive days post synchronization. Goats that exhibited oestrus were isolated.

### Progesterone hormone assay

Blood samples (5 ml) were obtained with sterile needle and syringe by jugular vein puncture of two does selected at random from each replicate on days 7 and 14 of progesterone treatment for serum progesterone evaluation. The blood was cooled immediately in container containing ice cubes and transferred to the laboratory, refrigerated at 4°C for 1 h and the serum separated by centrifuga-

tion at 5,000 rpm for 10 min. The serum obtained was stored immediately at -20°C until analyzed using standard Enzyme Linked Immunosorbent Assay (ELISA) kits according to methods described by McDonald (1975) and Nowshari et al. (1999).

### Data analysis

All the data collected from this trial were analyzed using the analysis of variance (ANOVA) (Steel and Torrie, 1980) and treatment means when significant were separated by the use of Duncan's New Multiple Range Test as described by Obi (1990).

## RESULTS

The results of the effects of different doses of progesterone in oestrus synchronization of West African dwarf goats are shown in Table 1. The results showed that does on 12.5 mg progesterone administration did not differ significantly (P > 0.05) from goats on the control treatment (physiological saline) in the number of goats exhibiting oestrus, however, they differed significantly (P < 0.05) from goats on 25.0 and 37.5 mg progesterone injections in the number of goats showing oestrus.

The signs of heat observed in this study included frequent bleating, wagging of the tail, seeking the male and allowing mounting. The does irrespective of progesterone dosage administered exhibited oestrus behavioural signs post synchronization treatment.

There were significant differences (P < 0.05) between the treatment groups in the percentage of goats that showed heat. Goats on 25.0 and 37.5 mg progesterone with 33.33 and 16.66% respectively did not differ significantly (P > 0.05), however, they differed significantly (P < 0.05) from goats on 12.5 mg and the control with 66.66 and 83.38% respectively.

The results showed significant differences (P < 0.05) between treatment groups in oestrus duration. Does on the control treatment recorded the highest oestrus duration of 40.35 ± 0.14 h followed by goats on 12.5 mg progesterone injections of 30.25 h. The lowest duration of oestrus was observed in goats treated with 25.0 and 37.5 mg progesterone of 19.6 ± 0.02 and 19.0 ± 0.25 h respectively.

**Table 2.** Effect of progesterone injections on serum progesterone levels (nmmol/L) in West African dwarf goats.

Day	Progesterone treatment (mg)			
	1.0 ml (Control saline)	12.5	25.0	37.5
7	0.70 ± 0.85 <sup>c</sup>	31.63 ± 0.38 <sup>b</sup>	33.66 ± 1.33 <sup>b</sup>	46.70 ± 0.94 <sup>a</sup>
14	9.70 ± 0.85 <sup>d</sup>	31.26 ± 0.42 <sup>c</sup>	32.46 ± 0.47 <sup>b</sup>	46.40 ± 0.92 <sup>a</sup>

a' b' c' d: Mean within row having different superscripts are significantly different ( $P < 0.05$ ).

There was no significant difference ( $P > 0.05$ ) in mean intensity of heat between the treatment groups. Goats on the control showed higher mean intensity of 73.33% while goats on 37.5 mg progesterone injections recorded the lowest mean heat intensity of 63.2%.

The results (Table 2) showed significant differences ( $P < 0.05$ ) in serum progesterone levels on the 7<sup>th</sup> day of progesterone injections between the treatments. Goats treated with 37.5 mg progesterone recorded a superior value of  $46.70 \pm 0.94$  (nmmol/L) and this differed significantly ( $P < 0.05$ ) from goats treated with 12.5 and 25.0 mg progesterone. Serum progesterone levels did not show any significant difference ( $P > 0.05$ ) between goats treated with 12.5 and 25.0 mg progesterone showing serum progesterone levels of  $31.63 \pm 0.38$  (nmmol/L) and  $33.66 \pm 1.33$  (nmmol/L) respectively. There were significant differences ( $P < 0.05$ ) between the treatments in serum progesterone levels on the 14<sup>th</sup> day of progesterone treatment. Goats treated with 37.5 mg progesterone had the highest serum progesterone level of  $46.40 \pm 0.92$  (nmmol/L) and this was followed by goats on 25.0 mg progesterone treatment recording  $32.46 \pm 0.47$  (nmmol/L) and goats on 12.5 mg progesterone treatment with a mean serum progesterone value of  $31.26$  (nmmol/L). These values were higher than the values obtained from untreated goats.

## DISCUSSION

The results of this study showed that does treated with 12.5 mg progesterone injections were similar to goats on the control treatment (physiological saline), but differed significantly from goats treated with 25.0 and 37.5 mg progesterone in the number of the goats showing oestrus. The fact that 4 out of 6 goats (66.6%) on 12.5 mg progesterone treatment exhibited oestrus within 2 – 3 h post synchronization is an indication of good precision by progesterone induced synchronization in West African dwarf goats. The precision in oestrus manifestation of goats in the control treatment is similar to those treated with 12.5 mg progesterone. This agrees with earlier reports on synchromate (SMB) synchronization augmented with follicle stimulating hormone (FSH) gonadotrophin releasing hormone (GnRH) and or prostaglandin  $F_{2\alpha}$  in goats (McGowan et al., 1992; Kusina et al., 2000). In the present trial, the progesterone effect on oestrus synchro-

nization in West African dwarf goats agrees with the earlier reports of Molokwu and Igono (1978) who reported that varying doses of progesterone affected oestrus incidence in Brown goats of the Nigerian Savannah zone.

The duration of oestrus was longer in goats treated with 12.5 mg progesterone. The duration of oestrus in this study averaged ( $31.7 \pm 0.22$  h) and is within the range (28 – 32 h) reported by Akusu and Egbunike (1990) in West African dwarf goats. However, the values were longer than ( $26.8 \pm 9.8$ ) obtained in Nigerian Brown Savannah goats by Molokwu and Igono (1978). The observed difference in oestrus duration may be attributed to breed differences as was reported by Alaku and Danladi (1987) in Borno White and Sokoto Red goats.

The highest number of goats showing oestrus was observed in 12.5 mg progesterone treatment whereby 5 out of 6 goats (66.66%) treated with 12.5 mg progesterone showed oestrus. It is possible that 12.5 mg progesterone injection was efficient in suppressing heat and at the same time triggering off physiological mechanisms for the regression of the corpus luteum; hence removal of the progesterone “block” led to increase in oestrus manifestation post synchronization. These findings are in agreement with the reports of Kinder (1992) who indicated that removal of the progesterone “block” by luteolysis of the corpus luteum results in increased estrogen secretions leading to onset of oestrus.

The signs of heat (frequent bleating wagging of the tail, seeking the male and allowing mounting by the does) were observed in this study. These observations are in confirmation with the findings of Akusu and Egbunike (1990) in West African dwarf goats. Vulvar swelling was observed only in 4 out of the 24 goats. Creamy vulvar discharge was observed 18 – 96 h after the end of oestrus. These findings agree with the reports of Molokwu and Igono (1978) in Brown goats of Nigerian Savannah zone. In this study it was observed that goats of West African dwarf breed exhibit clear psychic manifestation of oestrus.

Higher serum progesterone levels were observed in goats treated with 37.5 mg progesterone on the 7<sup>th</sup> and 14<sup>th</sup> day of treatment. The observed increase in the serum progesterone level may be attributed to extension of the life span of the corpus luteum which is the source of progesterone in domestic animals (Kinder, 1992). This also reflected reduced number of goats showing oestrus on 37.5 mg of progesterone treatment. These findings

agree with the reports of Stellflug et al. (1994) who indicated that suppression of oestrus, ovulation and follicular growth was effective with higher doses of progesterone and majority of ewes showed no oestrus in 24 h period and the few that showed oestrus exhibited behavioural signs. The injections of progesterone involves suppression of ovarian follicular development during an artificially extended luteal phase in West African dwarf goats and after removing the hormonal blockade, goats rebound into a compact follicular phase followed by a synchronized oestrus (Akusu and Egbunike, 1990).

## Conclusion

The results of this study showed that West African dwarf does respond to varying doses of progesterone in estrous synchronization regimen.

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