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Variation in Rectal Temperature Following Estruos Synchronization Using Different Concentrations of Flourogeston Actetate Sponge in Red Sokoto Does

Samuel, F.U[1], Kolo, H.N[2], Fanaiye, G.O[3]. and Okoro, L.I.[4]

[1]National Animal Production Research Programme/Ahmadu Bello University, Zaria, Nigeria.
[2]Department of Animal Production, Federal University of Technology, Minna. Nigeria.
[3]Department of Theriogenology and Production, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria.
[4]Department of Theriogenology, Faculty of Veterinary Medicine, University of Agriculture Makurdi, Benue State.

Abstract

The study examined the variation in rectal temperature following estrous synchronization using different concentrations of intravaginal flourogeston acetate (FGA) sponge in the Red Sokoto does. Temperature is a valuable indicator of the health status of the animal and may play a part in diagnosis of disease. The FGA sponge (35 and 40 mg) has been widely used in estrous synchronization in domestic animals. Twenty (20) apparently healthy multiparous Red Sokoto does aged 1½-2 years with average body weight of 25±0.65 kg and body condition score of 3.5 and above were randomly selected and used for the study. The does were divided into two groups of ten (10) does each, Group I (n=10) treated with 35 mg FGA and group II (n=10) treated with 45 mg FGA sponge, respectively and left in situ for 14 days before withdrawal. Rectal temperature was taken with digital thermometer hourly for six hours (6 am- 12 noon) from day 0 and every other day for 21 days for all the does in groups I and II. The mean rectal temperature was found to increase gradually but not significantly (P>0.05) from day 0 to 13 in both groups with higher values in group II, then increased significantly (P<0.05) from day 13 to 19 (38.7±0.2- 39.8±0.5°C) and day 15-19 (38.7±0.4 - 39.4±0.2 °C) in group II (45 mg FGA) and I (30 mg FGA) respectively, after which a decrease was observed till day 21 in the treated groups. The maximum temperatures at estrus were 39.4±0.2°C in group I (30 mg FGA) and 39.8±0.5°C in group II (45 mg FGA). It can be concluded the period of estrus elaborated higher rectal temperature than other phases of estrous cycle and rectal temperature could served as adjunct parameter in detecting estrus in does.

Keywords: Red Sokoto, Fluorogeston acetate, sponge, rectal temperature, estrus

Introduction

The constant increase in Nigeria's population size has necessitated increase in protein sources. This gap between the growth rate in human population and the availability of animal protein to cater for their dietary needs is of great concern (Riaz *et al*., 2012). Goat production has the potential to narrow the gap. In Nigeria, goats are kept for economic reasons, as source of animal protein and hide for industrial use. Red Sokoto goats accounts for over 60 % of the Nigerian goat population (Riaz *et al*., 2012). They are a good meat breed and are known for their suitability for fine leather (Adeyinka and Mohammed, 2006). Efforts aimed at improving fertility rates of goats involve the application of reproductive biotechnologies such as estrous synchronization and ovulation to achieve the increase multiplication and enhanced meat production (Regueiro *et al*., 1999).

Synchronization of estrous is an important management tool that has been used as an aid for artificial insemination (AI) and to reduce seasonal effects in the reproduction of dairy

goats (Freitas *et al.,* 1997). Within a year, reproductive activity in goats is composed of non-breeding season, transition period and breeding season (Pierson *et al*., 2001). Thus, various protocols have been developed to control reproduction activities throughout the year including the buck effect, photoperiod treatments and the use of exogenous hormone treatment (Whitley and Jackson, 2004; Lopez-Sebastián *et al*., 2014). Estrous synchronization enables kidding over a limited period thereby allowing producers to give optimum care for the dams and kids. Besides, producers are able to breed their goats so they can kid at the time of the year when pasture is more abundant. Two methods commonly used to synchronize estrous in goats include the use of prostaglandins and progestagens (Abecia *et al*., 2012). The use of intravaginal progestagens followed by administration of pregnant mare's serum gonadotrophin (PMSG) to synchronize estrous and to improve ovulation rate has been reported in sheep and goats (Omontese *et al*., 2012) and use of progesterone or a progestogen analogue alone to synchronize estrous in goats during the breeding and non-breeding season has also been reported (Ahmed *et al.,* 1998).

Rectal temperature gives indication of the core temperature and is one of the important vital parameters that are used to evaluate the health status of domestic animals. Rhythmicity in body temperature is an important physiological process both as a convenient and reliable marker of the operation of the biological clock (Klerman *et al*., 2002) and as an indicator of the general health of an animal and of its energy metabolism (Blumberg, 2002). The effect of estrous cycle on body temperature has been reported in cow (Zakari *et al*., 1981; Giuseppe *et al*., 2003)

Information on the effect of different progestagen concentration on rectal temperature of goats has not been fully documented. The objective of the study was therefore to compare the variation in rectal temperature following estrous synchronization using different concentration of intravaginal progestagens.

Materials and Methods

Twenty (20) apparently healthy multiparous Red Sokoto does aged 1½-2 years with average body weight of 25±0.65 Kg and body condition score of 3.5 and above were randomly selected and used for the study. The does were tagged using plastic ear tags for identification. All does were kept in semi-open pens throughout the experimental period and fed a basal diet with a concentrate feed mixture according to NRC (2007) requirements for goats. Fresh drinking water was given daily *ad-libitum*. The does were randomly divided into two groups of ten (10) does each in complete randomize design, Group I (n=10) was treated with 35mg intravaginal fluorogestene acetate and group II (n=10) treated with 45mg (FGA) sponge and left in situ for 14 days before withdrawal. Rectal temperature was measured using digital thermometer. The temperature was taken hourly for six hours (6 am- 12 noon) on the day 0 (day of insertion) and every other day within a 21 day experimental period from all the does in group I and group II.

Data Analysis

Values obtained were expressed as mean (± SEM) and subjected to one-way analysis of variance (ANOVA), followed by Tukey's post-hoc test. The statistical package used was GraphPad Prism version 4.0 for windows (2003) from GraphPad software, San Diego, California, USA (WWW. Graphpad.com). Values of $P < 0.05$ were considered significant.

Results

The mean values of rectal temperature variations in Red Sokoto does treated with 30 mg and 45mg intravaginal flourogeston acetate impregnated sponge are shown in Tables 1 and 2.

Table 1: Mean daily rectal temperature variation of Red Sokoto does synchronized with 30 mg fluorogeston acetate intravaginal sponge

	Rectal Temperature (°C)										
Time (hours)	Day 0	Day 3	Day 5	Day 7	Day 9	Day 11	Day 13	Day 15	Day 17	Day 19	Day 21
6 am	38.0±0.1	38.1±0.2	38.0±0.5	38.2±0.1	38.0±0.1	38.4±0.1	38.6±0.0	39.0±0.1	39.1±0.0	39.1±0.1	38.4±0.1
7 am	38.0±0.1	38.0 ±0.2	38.2±0.1	38.2±0.2	38.2±0.3	38.6±1.1	38.6±0.3	38.9±0.0	39.0±0.7	39.0±0.7	38.5±0.5
8 am	38.2±0.2	38.2±0.1	38.3±0.3	38.3±0.1	38.2±0.2	38.6±0.8	38.6±0.5	39.2±0.2	39.4±0.2	39.2±0.1	38.3±0.4
9 am	38.0 ±0.1	38.2±0.3	38.4±0.0	38.4±0.1	38.3±0.1	38.6±0.1	38.7±0.3	39.1±0.3	39.5±0.2	39.4±0.2	38.6±0.0
10 am	38.3±0.0	38.4±0.1	38.4±0.1	38.2±0.8	38.5±0.0	38.7±0.0	38.7±0.2	39.0±0.1	39.5±0.4	39.0±0.8	38.7±0.5
11 am	38.3±0.1	38.5±0.1	38.5±0.0	38.5±0.1	38.5±0.1	38.7±0.2	38.9±0.3	39.2±0.1	39.6±0.4	39.7±0.6	38.6±0.2
12 noon	38.5±0.1	38.5±0.4	38.6±0.1	38.6±0.0	38.7±0.2	38.8±0.1	38.9±0.5	39.3±0.2	40.0 ±0.2	39.7±0.1	38.8±0.0
TAMDRT	38.2±0.2	38.2±0.5	38.4±0.2	38.4±0.3	38.3±0.1	38.3±0.3	38.9±0.4	39.1±0.6[a]	39.4±0.2[b]	39.3±0.3[c]	38.6±0.2

TAMDRT:Total Avearge Mean Daily Rectal temperature (°C)

[abc]Mean with different superscripts on the same row are considered statistically significant (P<0.05)

Table 2: Mean daily rectal temperature variation in Red Sokoto does synchronized with 45 mg fluorogeston acetate intravaginal sponge

	Daily Rectal Temperature °C										
Time	Day 0	Day 3	Day 5	Day 7	Day 9	Day 11	Day 13	Day 15	Day 17	Day 19	Day 21
6 am	38.2±0.1	38.3±0.1	38.3±0.5	38.3±0.1	38.3±0.2	38.4±0.1	38.6±0.0	39.2±0.7	39.3±0.2	39.3±0.1	38.5±0.2
7 am	38.2±0.1	38.3±0.5	38.3±0.1	38.4±0.2	38.4±0.0	38.6±1.1	38.6±0.3	39.0±3.1	39.5±0.3	39.4±0.0	38.5±0.3
8 am	38.3±0.2	38.4±0.1	38.4±0.3	38.4±0.1	38.4±0.1	38.6±0.8	38.7±0.5	39.4±1.1	39.8±0.3	39.7±0.2	38.6±1.1
9 am	38.2 ±0.3	38.2±0.0	38.4±0.0	38.4±0.1	38.5±0.4	38.7±0.1	38.7±0.3	39.2±0.1	39.7±0.3	39.5±0.3	38.7±0.1
10 am	38.4±0.5	38.5±0.0	38.5±0.1	38.5±0.8	38.5±0.1	38.8±0.0	38.8±0.2	39.1±0.0	40.0 ±0.2	39.5±0.2	38.8±0.4
11 am	38.4±0.2	38.5±0.2	38.6±0.0	38.6±0.1	38.5±0.2	38.8±0.2	38.8±0.3	39.2±0.1	40.0 ±1.1	39.7±0.2	38.8±0.2
12noon	38.5±0.3	38.5±0.5	38.7±0.1	38.7±0.0	38.7±0.3	38.9±0.1	39.8±0.5	39.3±0.5	40.0±2.0	39.7±0.1	39.4±0.2
TAMDRT	38.3±0.3	38.4±0.3	38.5±0.2	38.5±0.3	38.47±05	38.7±0.4	38.7±0.23[a]	39.3±0.2[b]	39.8±0.5[c]	39.5±0.5[d]	38.7±0.3[e]

TAMDRT: Total Average Mean Daily Rectal temperature (°C)

[abcde]Mean with different superscripts on the same row are considered statistically significant (P<0.05)

The rectal temperature was observed to increased gradually and non significantly (P>0.05) from day 0 to day 13. However a significant increase was observed from day 13 to day 19 in group II (45 mg) and day 15 to 19 in group I (30 mg FGA). A non significant decrease was observed from day 19 to day 21 in group I and significant decrease was observed from day 19 to day 21 in group II. The maximum range (38.65±0.4 - 39.44±0.2°C in group I and 38.7±0.23- 39.8±0.5°C in group II) of rectal temperature was observed within the estrus (heat) period (day 15-19). The maximum temperature at estrus in group II (FGA-45 mg) was significantly higher than that in group I (FGA-30 mg) as shown in Figure I.

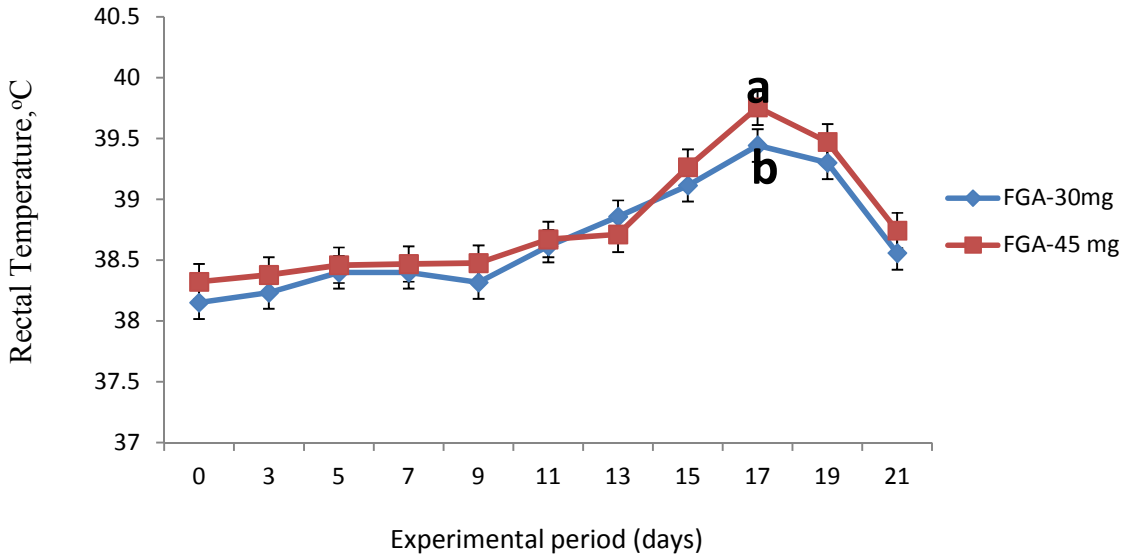

Figure I. Changes in the mean daily rectal temperature following estrus synchronization using 30-mg and 45-mg fluorogestone acetate in Red Sokoto does

Discussion

This work has revealed that different concentration of Fluorogeston acetate used in estrous synchronization produced variation in rectal temperature in Red Sokoto does. The daily increase in rectal temperature observed in this study for both 30 mg and 45 mg FGA could be attributed to changes in the vaginal flora ecology after the insertion of intravaginal sponges. This agreed with the report of Martins *et al*. (2009) and Manes *et al*. (2010) in ewe who observed that intravaginal device changes the aerobic vaginal flora which can alter thermoregulation. The changes in rectal temperature could also be due to endocrine changes associated with gradual and daily release of progesterone from the FGA sponge which led to increasing serum levels of progesterone concentrations and which influence thermoregulation and alter body temperature this is in line with the report of Amer and Hazzaa**,** (2009); Robinson and Scaramuzzi, (1994) and Greyling *et al*. (1988), who observed the effect progesterone on body temperature**.** The withdrawal of the FGA sponge led to sharp increase in the concentration of serum estradiol resulting in estrus and this accompanied by the maximum

core temperature as shown in this work this agrees with the report of Giuseppe *et al*., (2003) who reported that the core temperature attained maximum value at estrus **.** Our observation of a sharp rise in body temperature on the day of estrus is consistent with previous observations by other researchers (Wrenn *et al*.,1958; Lewis and Newman,1984; Fordham *et al*., 1988; Kyle *et al*., 1998 and Redden *et al*., 1993) although their observations was on dairy cow. Although quantitative data was not collected on locomotor activity, it was observed that there was a conspicuous elevation in activity on the day of estrus, which is similar with previous report by Redden *et al*. (1993), as a result the estrus-related elevation in body temperature might be a consequence of the increased thermogenesis associated with increased activity. However, the fact that body temperature started to rise a few days before the day of estrus suggests the existence of an activity-independent process analogous to that observed in the present study this is consistent with the findings of Gander *et al*., (1986) and Refinetti, (1999). The higher temperature observed in the FGA-45 mg compared to FGA-30mg could be attributed to concentration effect as FGA 45 mg releases more progesterone than FGA 30 mg. This agrees with the report Giuseppe *et al*. (2003) who demonstrated that higher core temperatutre with higher progesterone level in dairy cattle and consequently on removal FGA 45mg elicited greater estrogen concentration and more elaborate estrus characterized by greater activities this is consistent with the report of Refinetti, (1999). However, attempts to predict the day of estrus (heat) using rectal temperature at least a day in advance had a positive rate of about 70% in the Red Sokoto doe used in this study. This value is within the range of those obtained in previous studies (Kyle *et al*., 1998 and Redden *et al*., 1993). This work does not however, characterize the measurement of body temperature as a reliable method for the prediction of estrus but can serve as adjunct in predicting estrus in Red Sokoto does. This work therefore showed that rectal temperature could be an adjunct marker to estrus in Sokoto red goat.

Conclusion

It can be concluded from this study that period of estrus (heat) elaborated higher levels of rectal temperature value than other phases of estrous cycle in Red Sokoto does, higher concentration of progesterone (45 mg) resulted in higher rectal temperature than 35 mg progesterone impregnated sponge. Hence, rectal temperature could served as adjunct parameter in detecting estrus in does

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