ISSN 0189-0514

J. Anim. Prod. Res. (2017) 29(1):88-94

National Animal Production Research Institute
Ahmadu Bello University
P.M.B 1096, Shika-Zaria,
Kaduna State, Nigeria.
Email:japr@napri.gov.ng
Website: http://journals.napri.gov.ng

COMPARATIVE STUDY ON OESTRUS RESPONSES USING SINGLE AND DOUBLE TREATMENTS OF $PGF_{2\alpha}$ (LUTALYSE®) IN NIGERIAN JENNIES

***Hassan, R., Rekwot, P. I., Bawa, E. K., Mohammed, A. K., Lawal M., Oke-Egbodo, B. E., Bello, T. K., Hussaini, M., Umar, U. A. and Maikaji, F. S.**

National Animal Production Research Institute, Ahmadu Bello University, Shika Zaria, Nigeria.
**Corresponding author: hraheelah@gmail.com 08036479918*

ABSTRACT

This study was carried out to evaluate oestrus responses using single and double treatments of $PGF_{2\alpha}$ (Lutalyse®) in Nigerian Jennies. Eight (8) cycling Jennies aged 3.5±1.0 years were used for this study. The jennies were randomly assigned to 2 groups of 4 jennies each; Group 1 (n=4): jennies treated with a single injection of 10mg of Lutalyse®; Group 2 (n=4): jennies treated with double injections of 10 mg of Lutalyse®. Blood was collected from the jennies for extraction of serum, for progesterone and oestradiol estimation using Enzyme-Linked Immunosorbent Assays (ELISA). Groups 1 and 2, had time to onset of oestrus of 10.07 ± 4.91 and 3.98 ± 0.95 hours ($P>0.05$), duration of oestrus of 24.0 ± 0.0 and 78.0 ± 22.7 hours ($P<0.05$), oestrus response rate of 25 and 75% and intensity of synchronization within 48 hours was 50 and 75% ($P<0.01$), respectively. From this study it was established that the oestrus period and oestrus cycle length of synchronized Jennies was 8 days and 25 days in Nigerian indigenous Jennies. In conclusion, synchronization of Jennies is possible using exogenous $PGF_{2\alpha}$, however, double treatment of Lutalyse® had a better response, therefore, it is more efficient than single treatment in oestrus synchronization of Jennies. This study has shown that, plasma progesterone and oestradiol analyses are a valuable tool for the study of fundamental reproductive endocrinology in Nigerian Jennies.

Keywords: Nigerian Jennies, Oestrus Responses, Lutalyse, Oestrus Cycle, Oestrus Synchronization, Intramuscular Injection.

INTRODUCTION

There are 41.5 million donkeys worldwide (Desalegne *et al.*, 2011), with a population of 800 thousand donkeys in Nigeria (Maboyoje and Ademiluyu, 2004). Cross border movements by the pastoral Fulani from Niger, Chad, Burkina Faso, Mali and Cameroon, have increased the number of donkeys in Nigeria (Blench, 2004). In Nigeria, donkeys are concentrated mainly in the northern states because of the savannah type of vegetation and fewer disease vectors such as tsetse (RIM, 1992). About 16,000 donkeys are transported annually from the northern to south-eastern Nigeria, where they are slaughtered for food (ATNESA, 1997; Blench, 2004). Oestrus synchronization is the manipulation of the reproductive process so that females can be bred with normal fertility during a short, predefined interval (Mitchell *et al.*, 1976). This control facilitates breeding in two important ways: it reduces and in some cases eliminates the labour of detecting oestrus (heat), and it allows the producer to schedule the breeding. If the majority of a herd can be induced to exhibit oestrus at about the same time, the producer can arrange for a few days of intensive breeding or insemination. Although the total amount of labour involved with insemination may not be reduced, it is concentrated into a shorter period (Howey *et al.*, 1983).

Prostaglandin F_2 and its analogues have been used to induce oestrus and terminate pregnancy and in the management of reproductive disorders in domestic animals (Squires, 2008). Dinoprost tromethamine contains naturally occurring Prostaglandin-$F_{2\alpha}$ (dinoprost) as the tromethamine salt, which serve as the active substance. Each milliliter (ml) contains dinoprost tromethamine equivalent to 5 milligram (mg) dinoprost with 16.5 mg of benzyl alcohol added to as preservative. Injection of 5 ml lutalyse intramuscularly either once or twice at a 9 to 12 day interval will result in oestrus 1 to 5 days after injection (Salverson *et al*., 2002; Fred and Doug, 2012).

The specific objective of this study was to evaluate oestrus responses using single and double treatments of $PGF_{2\alpha}$ (Dinoprost tromethamine- lutalyse®) in Nigerian indigenous Jennies.

MATERIALS AND METHODS

Study area, experimental animals and management

This study was carried out at the donkey farm of the Equine and Camel Research Programme of the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika Zaria. The experiment was done for 2 months (8 weeks) from July to august. Eight (8) cycling Jennies aged 3.5 ± 1.0 years with mean body weight of 100.6 ± 6.5kg and mean body condition score of 3.5 ± 0.2 were used for this study.

The Jennies were kept outdoors in a group and fed *Digitaria smutsii* (woolly finger grass), concentrate rations at 1.2kg/jennies/day and hay as basal diet, water was provided *ad libitum*.

Experimental design

The animals were randomly assigned to 2 groups of 4 Jennies each

Group 1: Four Jennies were synchronized with a single treatment of 10mg (5mg/ml) of $PGF_{2\alpha}$ (Dinoprost tromethamine- Lutalyse®) intramuscular injection.

Day 0 Oestrus observation

Group 2: Four jennies were synchronized with double treatment of 10mg (5mg/ml) of $PGF_{2\alpha}$ (Dinoprost tromethamine- Lutalyse®) intramuscular injection, at 11 days apart.

Day 0 Day 11 Oestrus observation

The following oestrus characteristics were also recorded:

Duration of oestrus, onset of oestrus, oestrus response rate and intensity of synchronization.

Blood Sampling

Five (5) ml of blood samples was obtained from 8 Jennies via jugular veni-puncture using a 5 ml syringe (18 Gauge needle) by 8.00 a.m on the day of synchronization, then twice weekly for 8 weeks, to determine the progesterone and oestradiol concentrations. The blood samples were decanted into vacutainers and transported to the laboratory. Blood samples collected were centrifuged at 2000×G and serum harvested. Serum samples obtained were appropriately stored at -20˚C until analysis, for determining progesterone and oestradiol concentration using the principle of Enzyme-linked immunosorbent assays (ELISA).

Hormone assays

Concentrations of Progesterone and oestradiol were measured in the serum using enzyme-linked immunosorbent assays (ELISA) kits. The ELISA kits were obtained from Monobind® Inc, Lake forest. CA 92650 USA. The kits were used according to the manufacturer's specifications**.**

Data analysis

One way analysis of variance model was used. Oestrus response rate and intensity of synchronization were expressed as percentages. Data on progesterone and oestradiol profile values, duration of oestrus and time to onset of oestrus, were expressed as Mean ± S.E.M. Comparisons between the groups were carried out using one way ANOVA and T- test. The differences were considered significant when $P < 0.05$, highly significant when $P<0.01$ and not significant when $P > 0.05$. SAS system for windows 9.0 2012, was used for the analysis.

RESULTS

Table 1: Oestrus characteristics of jennies in the two treatment groups.

Parameters/Groups	Grp1 (1LT)	Grp2 (2LT)	LS
Onset of oestrus (hours)	10.07 ± 4.91^{a}	3.98 ± 0.95^{b}	*
Duration of oestrus (hours)	24.0 ± 0.0^{b}	78.0 ± 22.7^{a}	**
Oestrus response rate (%)	25^{b}	75^{a}	***
Intensity of synchronization (%)	50^{b}	75^{a}	***

[a,b] Means (±SEM) with different superscript indicates statistical significant differences ($P<0.05$).
Keys: LT- Lutalyse
LS- Level of significance

Progesterone and Oestradiol profiles for Group 1

The serum progesterone (P_4) and estradiol (E_2) concentrations of the samples collected for Group 1 are shown (Figure 1). The progesterone and oestradiol concentrations were inversely related, as progesterone peaks oestradiol decline. Mean serum P_4 concentration at the start of the study day 0, was 0.88 ± 0.61 ng/ml and mean serum E_2 concentration was 63.2 ± 49.94 pg/ml. The P_4 concentration rose to 6.45 ± ng/ml on day 3 after $PGF_{2\alpha}$ treatment and E_2 declined to 62.71 ± 45.79 pg/ml. However, P_4 and E_2 were highly significant ($P<0.01$).

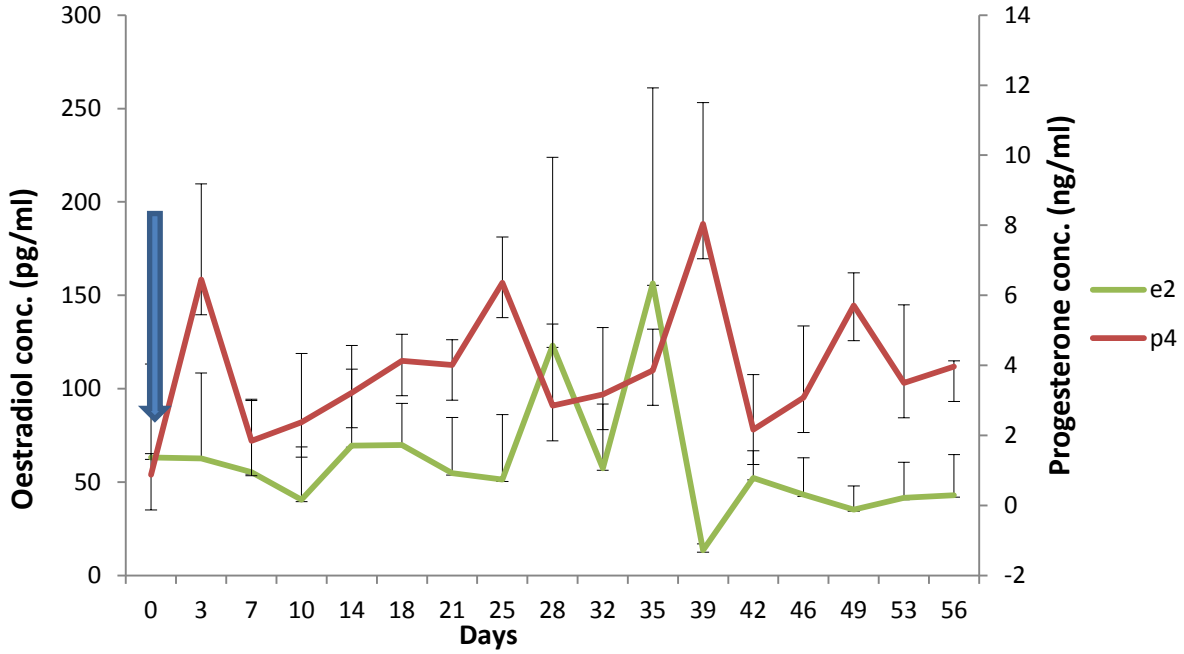


Figure 1: Progesterone and oestradiol profiles of Jennies treated with a single injection of 10 mg of $PGF_{2\alpha}$

Key:
Day 0= Day of first injection of 10mg of Lutalyse

Progesterone and Oestradiol profiles for Group 2

The serum progesterone (P_4) and oestradiol (E_2) concentration of the sample collected for Group 3 are shown in Figure 2. The progesterone and oestradiol concentrations were inversely related, as progesterone peaks oestradiol decline. Mean P_4 concentration increased from 6.53 ± 5.59 ng/ml at first $PGF_{2\alpha}$ injection to 9.10 ± 4.82 ng/m 11 days later when the second $PGF_{2\alpha}$ was injected while the E_2 concentration decreased from 18.98 ± 8.36 pg/ml to 18.46 ± 10.39 pg/ml. P_4 concentration started to decline after the second $PGF_{2\alpha}$ injection from day 11 at 9.10 ± 4.82 ng/m to 0.50 ± 0.10 on day 18 and E_2 concentration rose from 18.46 ± 10.39 pg/ml to 20.65 ± 11.6 pg/ml on day 21. However, P_4 and E_2 are highly significant ($P<0.01$).

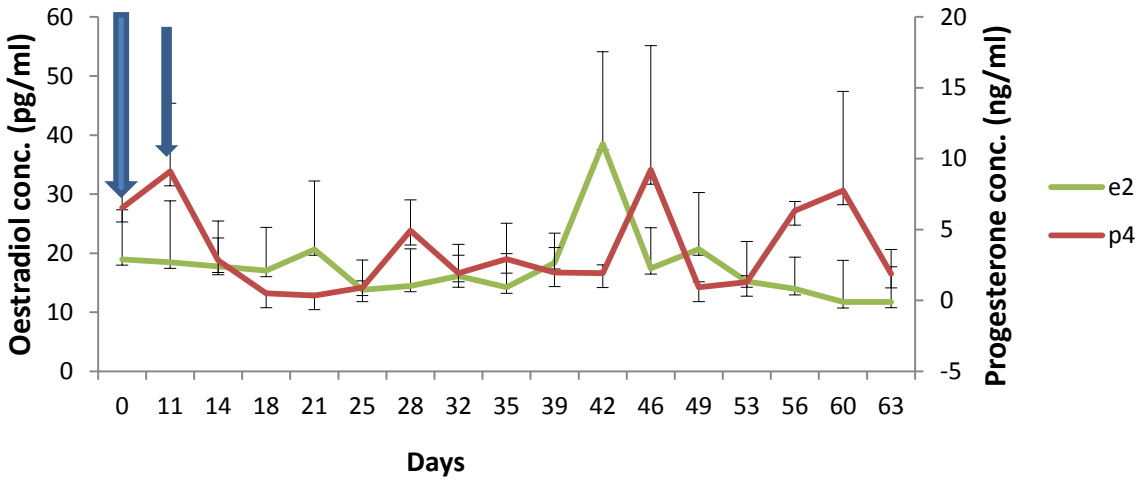


Figure 2: Progesterone and oestradiol profiles of Jennies treated with double injections of 10 mg of $PGF_{2\alpha}$

Keys:
Day 0= Day of first injection of 10mg of Lutalyse®.
Day 11= Day of second injection of 10mg of Lutalyse®.

DISCUSSIONS

Luteolysis and onset of oestrus was observed much earlier in group 2 (double treatment lutalyse) than group 1(single treatment lutalyse), however, the time to onset of oestrus in the two treatment groups in this study were shorter than the work of Blanchard *et al*., (1999), who observed that heat was induced 105.6 hours post $PGF_{2\alpha}$ (5mg Dinoprost tromethamine-Lutalye®) administration, this difference could be attributed to the differences of dosage of $PGF_{2\alpha}$ and the different protocols. The duration of oestrus was 24 and 78.0 hours in Groups 1 and 2, respectively, and this differs from the report of Meira *et al.*, (1995) who reported a longer duration of oestrus. This finding also differs from the earlier report of Blanchard *et al*., (1999) who established a longer duration of oestrus of 134.4 hours after $PGF_2\alpha$ treatment using 150mg $PGF_2\alpha$ and 10mg estradiol -17β.

A decline in progesterone levels occurred on day 7 after the first treatment with $PGF_{2\alpha}$ (Lutalyse®), similar to the work of Gordon, (1999) who reported that the corpus luteum of the ewe was receptive to $PGF_{2\alpha}$ or its analogues between days 5 and 14 of the oestrus cycle. In this study, a sharp decline in progesterone levels after the first and second treatment of $PGF_{2\alpha}$ (Lutalyse®), indicate successful luteolysis of existing corpora lutea and negative feedback of oestrogen. This corroborates the work of Ataman and Akoz, (2006) who reported that prostaglandins and its analogues have been known to induce luteolysis of the corpus luteum in domestic animals. It was established from this study that the oestrus period of groups 1 and 2, was 8 days and the oestrus cycle length of groups 1 and 2, was 35 and 21 days, respectively, these findings are similar to the work of Taberner *et al*., (2008) and McKinnon and Voss, (2003),

who established that the oestrus period can occur between 6 to 8 days, and the oestrus cycle from 25 to 26 days.

In conclusion, synchronization of Jennies is possible using exogenous $PGF_{2\alpha}$, however, double treatment of dinoprost tromethamine had a better response, therefore, it is more efficient than single treatment of dinoprost tromethamine in oestrus synchronization of Jennies. This study has shown that, plasma progesterone and oestradiol analyses are a valuable tool for the study of fundamental reproductive endocrinology in Nigerian Jennies.

ACKNOWLEDGEMENTS

We thank the Executive Director, National Animal Production research Institute (NAPRI), A.B.U, Shika Zaria, for providing the animals and facilities used for this work, all members of Biotechnology Research programme and NAPRI laboratory Samaru, members of Equine and Camel Research programme NAPRI, for their support and contribution into the success of this work.

REFERENCES

Ataman, M.B and Aköz, M. (2006). GnRH- $PGF_{2\alpha}$ and $PGF_{2\alpha}$- $PGF_{2\alpha}$ synchronization in Akkaraman crossbreed sheep in the breeding season.Bull. *Veterinary institute in pulawy*, 50: 101-104

ATNESA (1997). Improving donkey utilization and management. Report of the International ATNESA workshop held 5-9th May, DebreZeit, Ethiopia 6212 *African Journal of Agricultural Research*

Blanchard, T.L., Taylor, T.S., and Love, C.L. (1999). Oestrus cycle characteristics and response to oestrus synchronization in Mammoth Asses (*Equus asinus americanus). Theriogenology*, 52:827–834.

Blench, R. (2004). Natural resource conflicts in northwest Nigeria. A handbook and case studies. Mallam Dendo Ltd Cambridge, United Kingdom. P.106.

Desalegne, A., Bojia, E. and Ayele, G. (2011). Status of parasitism in donkeys of project and control areas in central region of Ethiopia: a comparative study. *Ethiopian Veterinary Journal* 15:2

Fred, M. and Doug, H. (2012). Lutalayse® and cloprostenol: Clearing up misconceptions. In Technical bulletin.

Gordon, I. (1999). Controlled Reproduction in sheep and Goat. CAB International, ISBN:0851991157

Howey, W. P., Jochle, W., and Barnes, W. J. (1983). Evaluation of clinical and luteolytic effects of a novel prostaglandin analogue in normal and problem mares. *Australian Veterinary Journal*. 60:180-183

Mabayoje, A.L. and Ademiluyi, Y.S. (2004). A note on animal power and donkey utilization in Nigeria. Animal Traction Network for Eastern and Southern Africa (ATNESA). P.2.

Mckinnon, A.O., and Voss, J.L . (2003). *Equine Reproduction*. Blackwell Publishing, Ames, Iowa. Pp. 130, 131, and 535.

Meira, C., Ferreira, J.C.P., Papa, F.O., Tornero, M.T.T. and Bicudo, S.D. (1995). Study of the oestrus cycle in donkeys (Equus asinus) using ultrasonography and plasma progesterone concentrations. *Biology Reproduction Monogastric*, 1:403–410.

Mitchell, D., De Gannes, R. and Sugden, E.A. (1976). Prostaglandin $F_2\alpha$ treatment of cyclic dysfunction in mares *Canadian Veterinary Journal*, 17: 301-307.

RIM (1992). Nigerian National Livestock Resource Survey. (VI vols). Report by Resource Inventory and Management Limited (RIM) to Federal Department of Livestock and Pest Control Services (FDL&PCS), Abuja, Nigeria.

Salverson, R.R., DeJarnette, J.M., Marshall, C.E and Wallace, R. A. (2002). Synchronization of oestrus in virgin beef heifers using melengesterol acetate and $PGF_{2\alpha}$: an efficacy comparison of cloprostenol and dinoprost tromethamine. *Theriogenology*. 57: 853-858.

Squires, E. L. (2008). Hormonal Manipulation of the Mare: A Review. *J. Equine Vet. Sci*., 28, 627-634.

Taberner, E., Medrano, A., Pen˜a, A., Rigau, T. and Miro´ J. (2008): Ooestrus cycle characteristics and prediction of ovulation in Catalonian jennies *Theriogenology*, 70: 1489–1497.