Effect of exogenous oxytocin hormone on oestrus synchronization in Nilotic goats of Sudan

A. O.M. Ali, and A. M. AbduRahman

Sudan University of Science and Technology – Sudan
College of Animal Production Science and Technology
College of Agricultural Studies

SUMMARY

This experiment was conducted to determine the effect of exogenous oxytocin hormone on oestrus induction and synchronization in groups of (n - 8) , and the control group (n = 8) . were considered for this study . The created group was injected with 50 IU of synthetic oxytocin deep im on day zero , day , day 14 and day21 of the experiment , while the control group had zero treatments . Blood samples were taken from each doe in both groups every other day starting from day zero till day 27 of the experiment . Oestrus diagnoses were mainly via progesterone immunoassay based on 14 level to be below2ng / ml , and heat signs as confirmatory elements . Emphasis was put on the synchronies after the 3 dose of oxytocin injection Results obtained showed that the treated group performed 75 % of destrus synchronies while the control group obtained 50 % of oestrus . Statistical analysis using Chi - square test had indicated no significant difference (P > 0.05) between the two groups in oestrus synchronization , but treated group had gained pronounced higher percentage of oestrus synchronization , i.c.75 % vs. 50 % . In conclusion Oxytocin , via its luteolytic physiological property , apparently causes oestrus synchronization in Nilotic goats using 50 IU , oxytocin . So , 50 IU of oxytocin can be considered as a research dose for oestrus synchronization in the above mentioned breeds , despite the insignificant difference .

INTRODUCTION

Oxytocin has several functions , contraction of uterine muscles , increased contraction frequency in the oviduct , the transport of both female and male gametes in the oviduct and milk led down , Hafez , 1993. During the follicular phase of the cycle , mating results in release of oxytocin , which may aid sperm transport through increased uterine contractions , Swenson and Reece 1993. Oxytocin is an acute stimulant for PGF2a secretion from ovine endometrium and may be responsible for generating the luteolytic pulses of PGF2a late in the estrous cycle ; Burns et al . , 2001. A rise in follicular oestrogen production causes an increased endometrial oxytocin receptor concentration , thereby facilitating the stimulatory effect of oxytocin on PGF2a production , Sheldrick et al . , 1980. It appears that the individual animal reproductive conditions have their impact on oxytocin-PGF2 secretion link , as Silvia and Taylor , 1989 , had stated that : individual differences in uterine secretion of PGF2a in response to oxytocin were related to stage of the cycle and to differences in the endogenous ovarian steroid environment within each stage of the estrous cycle . Estrous cycles can be shortened in some species by injection of oxytocin , Constance , 1976 Cooke and Kniffton , 1981. concluded that subcutaneous administration of oxytocin between days 3-6 , inclusive , significantly reduced the oestrous cycle in goats . Fertile oestrus was induced in dairy goats by subcutaneous administration of 100 IU oxytocin per day between days 3-6 of the estrous cycle , Cooke and Homeida , 1982. As for the prolongation of the estrous cycle in the goat , Cooke and Homeida , 1985 , found that active immunization against oxytocin significantly prolonged the estrous . Oral administration of the prostaglandin (PG) synthetase inhibitor meclofenamic acid (1 gm / day) prevented both the luteolytic action of oxytocin and the increase of PGFM concentrations , Cooke and Homeida , 1983. They concluded that the luteolytic effect of oxytocin is mediated via the production and release of the PGF2a . Newcomb et al . , 1977 , cited that : daily administration of oxytocin to heifers during the first week after ooestrus markedly shortens the ensuing diooestrus , and the subsequent ooestrus occurs 8-12 days instead of the usual 21 days , after the preceding ooestrus . Oxytocin treatment significantly reduced corpus luteum weight , progesterone concentration and 20B – ol

concentration , Harms and Malven , 1969. Concentrations of uterine oxytocin receptors were determined in carancular and inter - carancular endometrium and in myometrium , Sheldrick and Flint , 1986. They also stated that , the uterus is a major source of PGF2a after oxytocin administration . Luteolysis was associated with synchronous pulses of oxytocin and PGF2a secretion in unmated control hinds (female of the red deer) and this is similar to observations in sheep and cattle , Bainbridge et al . , 1997. At present the only established role for ovarian oxytocin is in the control of luteolysis , Wathes et al . 1989 , The objective of this study is to determine the effect of oxytocin hormone treatment on oestrus synchronization in groups of pure Nilotic Sudanese goats . This objective is supported by the fact that oxytocin is pharmacologically save , beside its reasonable market cost , compared to other hormones , like the prostaglandin - F2a .

MATERIALS AND METHODS

A population of 16 Nilotic does of Sudan selected from a herd with ages ranged between 2.25- 4 years , and body weights between 17.8 - 266 x was divided into two groups : (n = 8) , treated group and (1-8) control group They were randomly distributed . Both groups had similar feeding and environment conditions . The treated group was injected on day zero , day ? day14 and day21 of the experiment , with 50 IU of synthetic oxytocin (Oxytocin Synth . 10 IU / ml , Phenix Belgium) deep intramuscularly , while the control group had zero treatments . Blood samples were taken from each doe in both groups every other day starting from day zero till day 27 of the experiment . The sera then stored under -20 C until been assayed , using (Immunometrics (UK) Ltd assay protocol - 280 Munster Road , London SW6 Oestrus diagnoses were mainly based on progesterone immunoassay , at P4 level below2ng / ml , and heat signs which were considered as confirmatory element . The measurements of (P4) of each sample were reflected into 6BQ) . spread sheet table , indicating the samples P4 levels and their dates . They then put into tables formats for statistical analysis . Chi - square (0) , 2x2 contingency table was used for the quantitative data analysis . Calculated ? at a level of significance 0.05 % , indicates the significant difference between the compared values , El

Khidir , 2001. The equation calculation of calculated Chi - square was E x = (0 - E) 2/E .

RESULTS

6 out of 8 does of treated group , and 4 out of 8 does of control group , were in oestrus , that they showed oestrus signs during the 5 days period post 3 * dose of oxytocin injection . The two groups had obtained 75 % and 50 % oestrus status respectively . Table 1 statistical analysis using Chi - square test had indicated no significant difference P > 0.05 between the two groups in oestrus synchronization , although treated group had gained pronounced higher percentage of i.e.75 % . Consideration was given to results obtained after the 3'd dose of treatment .

Treated group Progesterone basal level at synchronized oestrus ranged from 0.06 to 1.4ng / ml . , while the control group oestrus P4 basal level had_ranged from 0.03 to 1.6 ng / ml . On day 16 , three animals of the treated group showed oestrus signs at P4 levels ranging from 0.06 to 1.4 ng / ml , and three ones had oestrus at the P4 levels ranging from 1.1 to 1.4ng / ml without heat signs being detected . An animal of 0.06ng / ml showed oestrus signs at a P4 level of 1.7ng / ml . As for the control group , two animals showed oestrus signs on day 16 , at the P4 basal levels of 0.01 and 1.6ng / ml . , while other two animals showed it at levels of 0.03 and 0.38ng / ml . The profile of the P4 levels of both groups (Figures 1-4) during the synchronizing zone , i.e. 5 days post the third dose were almost similar . Heat signs were male vocalling , mounting others , be mounted by others , and vaginal discharge .

Table1. The two groups oestrus synchronies.

Groups	Oestrus	No oestrus	Total
Control	4	4	8
Treated	6	2	8
Total	10	6	16

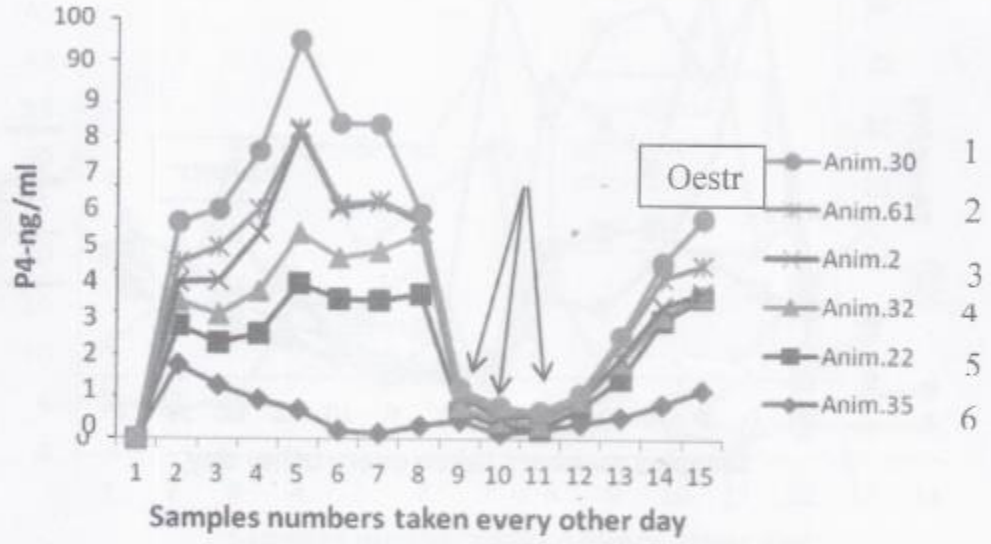

Figure1: Incidence of oestrus in oxytocin-synchronized does.

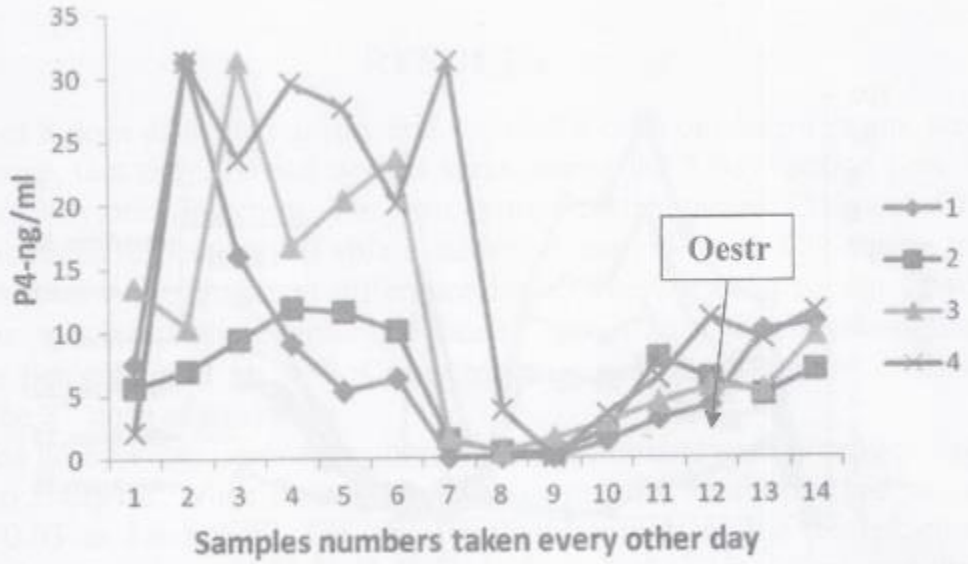

Figure2: Incidence of oestrus in control does.

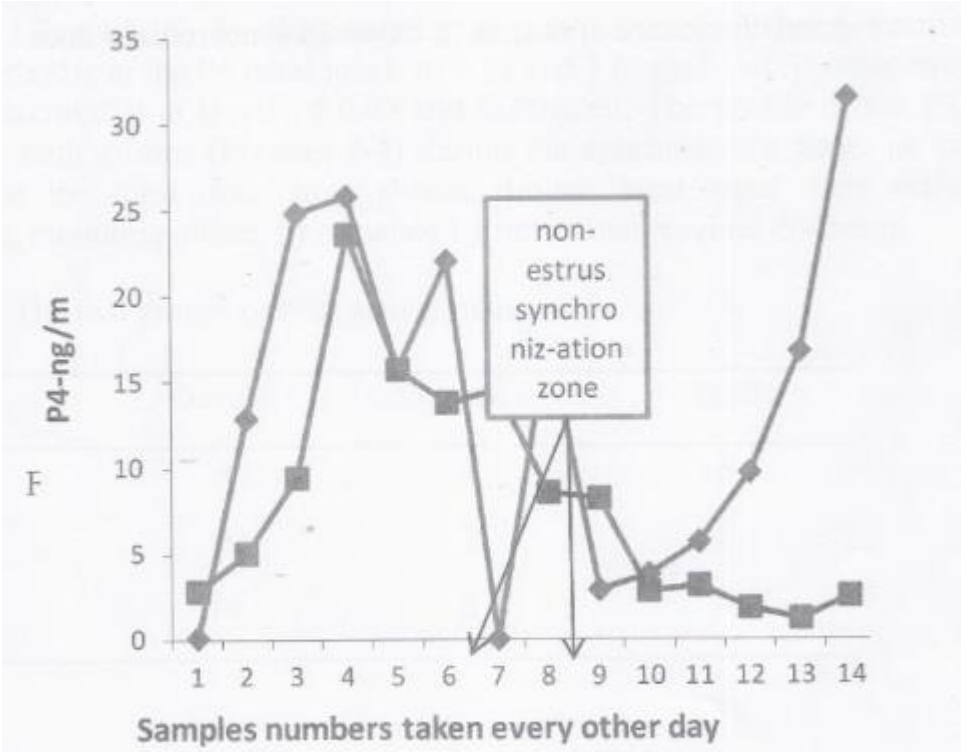

Figure3: Non oestrus does in oxytocin synchronized group

Figure4: Non oestrus in does control group.

DISCUSSION

Despite the fact that , the statistical analysis reflected insignificant difference (P > 0.05) in using OT hormone for oestrus synchronization in Nilotic goats of Sudan , but , using oxytocin at a dose of 50 IU , four times at an interval of 7 days apart , that resulted in 75 % synchrony indicated that the luteolytic effect of oxytocin had taken place on the corpus luteum . It could also be said that the percentage difference between the two groups was considerably high , and in favor of oxytocin treated group . This result also comes in agreement with Ali , 2011 that 50 IU of oxytocin treatments , but at 11 days apart , resulted in 75 % and 50 % oestrus synchrony in two groups of Sudanese Nubian goats . This oestrus percentage difference (25 %) between the treated and non - treated group , could be taken as an indication for the oxytocin luteolytic indication effect on the corpus luteum . This comes in an agreement with Wathes et al . , 1989 , who referred the role of ovarian oxytocin to the control of luteolysis . The 75 % of oestrus of the treated group suggesting oestrus synchronization , comes in consistence with Ibrahim 2000 , who found that the animals.

response to synchronization (as determined by signs of heat) was 44 % So , he considered the 44 % , which is lesser than the 75 % .to be synchronization response . This result of synchronies also matches with Burns , et al . 2001 when they reported that oxytocin is an acute stimulant for PGF2a secretion from ovine endometrium and may be responsible for generating the luteolytic pulses of PGF2a late in the estrous cycle . This has come very much in consistence with Sheldrick and Flint , 1986 , who stated that , the uterus is a major source of PGF2a after oxytocin administration , and with Bainbridge et al . 1997 when they found that synchronous pulsatile secretion of oxytocin and PGF2c induces luteolysis . And it is well known that the PGF2a is a strong luteolytic agent of the corpus luteum . The obtained results of oestrus synchronies were similar to Harms and Malven , 1969 reported that oxytocin treatment significantly reduced corpus luteum weight , progesterone concentration and 208-0l concentration . This synchronization of oestrus results also have come in consistence with Constance , 1976 , and Cooke and Kniffton , 1981 , who reported the effect of oxytocin on shortening or reducing the estrous cycle , and also , in agreement with Newcomb et al , 1977. This variation in synchronization percentage , 75 % and 50 % , between the two experimental groups . consolidates the concept of synchronization that the injected group performed bigger oestrus outcomes , indicating the effect of the oxytocin hormone , in contrast with the non injected group , which was put under uncontrolled and unknown oestrus times .

CONCLUSION

In conclusion , the oxytocin injections , though had given no significant difference in oestrus synchronization , $p > 0.05$, but this study indicated that oxytocin injection had performed quite accepted percentage of oestrus synchronies with three injections of 50 i.u oxytocin at 07 days intervals in Nilotic goats of Sudan , and the heat signs appeared at varying levels of P4 , which are : 0.01 , 0.03 , 0.38 , 0.06 , 1.4 , 1.6 and 1.7 ng / ml . The authors recommend further research , using bigger numbers of animals , so as to reach a fixed protocol of oestrus synchronization dosage with

oxytocin hormone ; and to further research on oxytocin - ProstaglandinF2a oestrus induction relationship .

ACKNOWLEDGEMENT

The authors thank Professor Intisar Y. Torkei , the Dean , College of Animal Production Science and Technology - Sudan University of Science and Technology , who facilitated this study to be managed in the college farm .

REFERENCES

Ali , Ahmed Omar M. (2011) . The Effect of Exogenous Oxytocin & Prostaglandin - F2u on Oestrus Synchronization and Conception Rate in Nubian and Nilotic Goats of Sudan - PhD thesis - Sudan University of Science and Technology , P.57 .

Bainbridge , D.R.J. and Jabbour , H.N. (1997) . Effect of pregnancy and exogenous interferon on synchronous pulsatile release of oxytocin and luteolytic ProstaglandinF2u in red deer (Cervus elaphus) . Journal of Reproduction and Fertility 111 , 299-307 . Burns , P.D. Mendes , J.O.B.

Yemm , R.S. Clay , C.M. Nelson , S.E. Hayes , S.H. and Silvia , W.J. (2001) . Cellular mechanism by which oxytocin mediate sovinc endometrial PGF 2a . Biology of Reproduction 65. 1150-1155 . Society for the Study of Reproduction . Inc.

Constance , R.M. (1976) . Text Book of Endocrine Physiology . New York - Oxford University Press . P. 336 .

Cooke , R.G and Homeida , A.M. (1982) . Plasma concentration of 13 14 - dihydro - 15 - keto Prostaglandin F2alpha and progesterone during oxytocin - induced oestrus in goat , Theriogenology , 18. (4) , 453 460 .

Cooke , R. and Homeida , A.M. (1983) . Prevention of the luteolytic action of oxytocin in the goat by inhibition of prostaglandin synthesis . Theriogenology , 20. (3) , 363-365 (Abstract) .

Cooke, R.G and Homeda, A.M. (1985) , Suppression of Prostaglandin F2alpha release and delays of luteolysis alteractive immunization against oxytocin in the goal Journal of Reproductive Fertility Vol . 75 : 63 - 68 .

Cooke , R.G. and Kniffton , A. (1981) , Oxytocin - induced oestrus in the goat . Theriogenology : 16 (1) : 95-7

EL khidir . O.M. (2001) . Elementary Statistics and Experimental Design . First Edition Animal Production Research Centre , Kuku Khartoum North , Sudan .

Hafez . E.S.E. in (1993) Reproduction in Farm Animals ... Edition.Pub.Leud Febiger Philadelphia , P.70

Harms , P.G. and Malven , P.V. (1969) . Modification of Bovine Lutcal Function by Exogenous Oxytocin and Progesterone J. Anim . Sci 1969 29 : 25-29 . [Abstract] .

Ibrahim , M.T. (2000) . Studies On Some Production and Reproduction Parameters of Nubian Goats and Their Saanen Cross Bred under Local Environmental Conditions . PhD Thesis . University of Khartoum - Sudan . P. 38 .

Newcomb , R. Both , W.D. Rowson , E.A. (1977) . The effect of oxytocin treatment on the levels of prostaglandin F in the blood . J. Reprod . Ferti.vol.49 , 17-24 . - El Khidir , O.M. (2001) . Elementary Statistics and Experimental Design First Edition . Animal Production Research Centre , Kuku .

Sheldrick , E.L. and Flint , A.P.E. (1986) . Transient uterine refractoriness after oxytocin administration in ewes J. Reprod . Fort 77 , 523-529 .

Sheldrick , E.L. , Mitchell , M.D. and Flint , A.P.F. (1980) . Delayed luteal regression in ewes immunized against oxytocin , J. Reprod . Fert . 59 , 37-42 .

Silvia , W.J. and Taylor , M. L. (1989) . Relationship between Uterine Secretion of Prostaglandin Fin Induced by Oxytocin and Endogenous Concentrations of Estradiol and Progesterone at Three Stages of the Bovine Estrous Cycle . J. Anim . Sci . 67 : 2347-2353 . [Abstract]

Swenson , M.J. and Reece , W. (1993) . Dukes ' Physiology of Domestic Animals . 11 " Edition . Comstock Publishing Associates Comell - Ithaca.P . 636 .

Wathes , D.C. Ayad , V.J. MeGoff , S.A. and Morgan , K.L. (1989) . Effect of active immunization against oxytocin on Gonadotropin secretion and establishment of pregnancy in the ewe . J. Reprod . Fert 86 , 653-664 .

Authors :
Ahmed Omar Mohammed Ali
AbdelAziz Makkawy AbduRahman

أثر حقن هرمون الأوكسيتوسين على تزامن الشبق في الماعز النيلي السوداني

أحمد عمر محمد علي وعبد العزيز مكاوي عبد الرحمن
جامعة السودان للعلوم والتكنولوجيا
كلية الإنتاج الحيواني للعلوم والتكنولوجيا

ملخص البحث

أجريت هذه الدراسة لتحديد الأثر الذي يحدثه هرمون الأوكسيتوسين بعد حقنه في مجموعة من الماعز النيلي السوداني في إحداث تزامن الشبق . وقد حددت مجموعتان منها لهذا الغرض ؟ بعدد 8 رؤوس لكل منهما ، والمعالجة منهما حقنت بجرعة من الهرمون كان تركيزها 50 وحدة عالمية ، كررت أربع مرات بفاصل زمني قدره أسبوعا ، أما المجموعة الثانية فقد اعتبرت مجموعة تحكم . أعتمد تشخيص الشبق على مستوى هرمون البروجسترون في العينات المأخوذة في الأيام التي تلت الحقن بمعدل يوم بعد أخر حتى اليوم السابع والعشرين للتجربة . وتم ذلك بالتحليل الهرموني ، ومن ثم تشخيص الحالة عند المستوى الأدنى المحدد في كل عينة ، بجانب رصد علامات الشبق كدلائل تأكيدية . النتائج خلصت إلى أن المجموعة المعالجة سجلت نسبة 75% من التزامن ، بينما سجلت المجموعة المتحكمة نسبة 50 % . وباستخدام مربع كاي في التحليل الإحصائي لم تلاحظ فروق معنوية بين المجموعتين بالرغم من حصول المجموعة المعالجة على نسبة معتبرة . وعليه فإن هرمون الأوكسيتوسين محدث للشبق عبر خاصيته في تفتيت الجسم الأصفر .