Vaginal mucus resistivity and intenseness of vulva discharge: Dis-Uniformity in trends had zero effect on conception following multiple insemination in Ovsynch-treated Bunaji Cows

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Abstract

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Vaginal mucus resistivity (VMR) and intenseness of vulva discharge (IVD) in 28 Bunaji cows subjected to multiple inseminations at 8th and 16th hours following ovulation synchronization were investigated. Cows were fed silage and crushed elephant grass with clean water provided ad libitum. The VMR and IVD were evaluated using Draminski[®] bovine estrous probe and visual observation, respectively. The difference between the total mean VMR (Ohms) at 8th and 16th hours (358.88 ± 239.15 and 343.88 ± 30.04) was not significant ($P > 0.05$). During 8th to 16th -hour, 60% and 40% of cows showed rising and declining VMR values, respectively. At the 8th and 16th hours, 60% and 40% of the cows had mean VMR that was lower and higher than the total hour-mean values, respectively. At these same hours, 28.57% and 28.57%, 71.43% and 42.86% as well as 0% and 28.57% of cows had copious, moderate and scant vulva discharges, respectively. All cows were positive for 30-day non-return to estrus, caruncular enlargements as well as fetal parts were also palpable at 90-day pregnancy check. We conclude that though, dis-uniformity occurred in vaginal mucus resistivity as well as intenseness of vulva discharge trends between inseminations at the 8th and 16th hours following Ovsynch treatment, this had zero effect on conception and pregnancy establishment in the cows.

Keywords: Vaginal mucus resistivity, vulva discharge, dis-uniformity, insemination, Ovsynch, Bunaji cows.

Introduction

There is increasing awareness on the importance of artificial insemination in improving the genetic potential of dairy cows in Nigeria. Several changes like alteration in vaginal mucus resistivity and intenseness of the mucus occur during natural estrous cycles in the cow as a result of hormonal interplay during the cycle (Benbia *et al.*, 2011). Hormonal treatment for synchronization has also been reported to influence the biochemical and physical properties of the mucus (Tsiliogianni *et al.*, 2001a, b). The status of vaginal mucus had been reported to influence fertility following insemination in cows (Dunson *et al.*, 1999). Vaginal mucus resistivity had hence been used to predict estrus and the

optimum time for insemination with the aim of achieving high pregnancy rates (Rorie *et al.*, 2002; Yamauchi *et al.*, 2009). The intenseness of vaginal mucus which is evident in vulva discharge at periods of artificial insemination has also been associated with fertility in cows (Bernadi *et al.*, 2015). Bunaji cow occupies a high proportion of the Nigerian national herd of cattle and has been kept both for milk and beef (Meghen *et al.*, 1999; Alphonsus *et al.*, 2012). In the study, the trends of vaginal mucus resistivity (VMR) and intenseness of vulva discharge (IVD) and their effect on conception following multiple insemination at the 8th and 16th hours in Ovsynch-treated Bunaji cows were investigated.

Vaginal-mucus trend dis-uniformity had zero-effect on conception.

Materials and methods

Study site

The study was carried out at a private dairy Farm in Saki, Oyo State, Southwest Nigeria.

Animals and management

Twenty eight Bunaji cows (>2 parities, >60 days post calving) were used for the study. The age of the animals varied from 2 to 3 years, body weight 250 - 350 Kg, and body condition score 3 - 4 on a scale of 5. The animals were housed in individual pens at night and grazed at day time in fenced paddocks for 3-5 hours daily. The cows were also fed silage and crushed elephant grass. Open cows were selected following rectal palpation as described by Leigh (2018). Briefly, following restraint in a chute, any cow in which amniotic vesicle, membrane slip, caruncles or any fetal part was not palpable, after about 35 days following exposure to a bull, was regarded as open.

Study design

Cows were inseminated at 8th and 16th hours following Ovsynch treatment. Vaginal mucus resistivity and intenseness of vulva discharge were evaluated prior to each insemination. A 30-day non-return to estrus was evaluated and pregnancy was confirmed at 90-day post insemination via rectal palpation (Leigh, 2018).

Oestrus synchronization

Oestrus synchronization was carried out using Ovsynch protocol (Pursley *et al.*, 1998). Cows were administered (i/m) 100µg Lecirelin[®] (Bioveta, Czech Republic) on d0 followed by administration (i/m) of 25mg Dinoprost Tromethamine (Zoetis Inc., Spain) on d7 and thereafter a repeat administration of 100µg Lecirelin[®] on d9.

Artificial insemination

Cows were served at 8th and 16th hours post synchronization with Holstein-Friesian semen (ELVIS PL 005317975027 Poland) using standard insemination protocol (Tsuma and Leigh, 2018).

Evaluation of vaginal mucus resistivity (VMR)

Bovine Estrous detector probe (Draminski[®] Owocowa, Poland) was used to obtain the vaginal mucus resistivity prior to insemination at 8th and 16th hours. Estrous probe and vulva of each cow were cleaned with slightly moist cotton wool. The vulva was slightly lubricated with K-Y jelly and the probe was gently inserted into the anterior vagina. The start button was activated and the probe was rotated, each time pressing the start button until the reading was displayed on the monitor. The resistivity of the vagina mucus was taken as the average of three separate readings per cow prior to insemination at 8th and 16th hours, respectively.

Evaluation of intenseness of vulva discharge (IVD)

The intenseness of vulva discharge was categorized into copious, moderate and scant as described by Bernadi *et al.* (2015). This was adjudged by visual observation of the quantity of mucus discharge prior to insemination at 8th and 16th hours.

Statistical analysis

Data was analyzed using descriptive statistics. Mean and standard deviation of vaginal mucus resistivity and proportions of intenseness of vulva discharge at 8th and 16th hours were compared with Paired t-test using the Statistical Package for Social Science (SPSS 23).

Results

Figure 1 shows the comparison of the mean values of vaginal mucus resistivity (VMR) post-Ovsynch treatment. The difference between the mean values of VMR at the 8th (358.88±239.15 Ohms) and the 16th (343.88± 30.04 Ohms) hours was not significant $P>0.05$.

Figure 2 shows the trend of VMR of cows between the 8th and 16th -hour post-Ovsynch treatment. It showed that 60% and 40% of the cows showed rising and declining patterns between the 8th and the 16th hours.

Table 1 shows how VMR of individual cows compared with the average-hour-VMR at the 8th and the 16th hours post-Ovsynch treatment. It showed as follows:

40% and 60% of the cows had higher and lower VMR values compared with the average-hour-values at the 8th (i.e. 358.88 Ohms) and the 16th (i.e. 343.88 Ohms) hours, respectively.

Table 1: Comparison of vaginal mucus resistivity (VMR) of individual cows with the Average-Hour-VMR at 8th and 16th hours post Ovsynch Treatment

Average-Hour VMR (Ohms)	Percentage AH-VMR	
	Higher	Lower
358.88 (8 th hour)	40	60
343.88 (16 th hour)	40	60

AH-VMR- Average-Hour VMR

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Table 2 shows the observations in the intenseness of vulva discharge during the 8th and the 16th -hour post-Ovsynch treatment. It showed as follows: copious- 28.57% to

28.57% (P>0.05), moderate- 71.43% to 42.86% (P<0.05) as well as scant- 0% to 28.57% (P<0.05), during the 8th and the 16th –hour post-Ovsynch treatment, respectively.

Table 2: Comparison of Intenseness of vulva discharge (IVD) of cows during the 8th and the 16th hour post Ovsynch Treatment

IVD	Period post-Synchronization		Significance
	8 th h	16 th h	
Copious	28.57%	28.57%	P<0.05
Moderate	71.43%	42.86%	P<0.05
Scant	0%	28.57%	P>0.05

Table 3 shows the observation on conception/pregnancy status of the cows inseminated at 8th and 16th hours post-

Ovsynch treatment. It showed that 100% of the cows had conceived/were pregnant at 30-day and 90-day following inseminations at 8th and 16th hours post Ovsynch treatment.

Table 3: Conception/Pregnancy status of cows following 8th and 16th –hour inseminations post Ovsynch Treatment

Pregnancy check	% Pregnant	% Open
30-day (n=28)	100	nil
90-day (n=28)	100	nil

Discussion

Although, the present results suggested similarity between the mean values of vaginal mucus resistivity (VMR) at both the 8th and the 16th hours post Ovsynch treatment in Bunaji cows, the comparative reduction (P>0.05) shown between the separate mean VMR values between these periods seemed to be expounded by observations on the trend of individual VMR. That most of the cows showed rising VMR while fewer showed declining values between the periods of study suggested some level of dis-uniformity in mucus resistivity trend as the cows progressed from the 8th to 16th –hour post synchronization. This position suggests that more cows showed lower VMR values at the 8th -hour compared with the 16th –hour. Though, further observation on individual VMR and the average-hour-VMR at each

stage may suggest contrariwise since equal proportions of cows at both hours had higher and lower VMR compared with the average value, the finding that the proportion of cows in either category was not same suffices to buttress the dis-uniformity earlier indicated. It is not clear why these fluctuations occurred. Though, it is established that constant changes do occur in the physico-chemical properties of the vaginal mucus during the cycle, the observations indicating dis-uniformity may also have been caused by asynchronous response in the cows to OvSynch treatment (Rivera *et al.*, 2004; Bisinotto *et al.*, 2014). The mean VMR values at 8th and 16th hours were higher (P>0.05) compared with lower values such as 150-220 Ohms, earlier reported to support good pregnancy outcome in cattle (Ahmed *et al.*, 2017; Subrota *et al.*, 2017).

This may have been due to changes caused by the synchronizing agents since it is established that their usage always lead to heightened values of vaginal mucus resistivity (BRR, 1999). The observation with intenseness of vulva discharge (IVD) appears to be similar to that of VMR. At the 16th hour, there was no change in proportion of cows with copious discharge whereas there was reduction ($P<0.05$) and an increase ($P<0.05$) in those with moderate and scant discharges, respectively. The pictures at both 8th and 16th hours for IVD therefore suggest some level of dis-uniformity similar to what was observed with VMR. Since it had been reported that more copious discharges are characteristic of estrus (Tsiligianni et al., 2001), the trend in the present study as informed by the status at the 8th and the 16th hours can suggest how further the cows were progressed away from estrus. Earlier reports (Murugavel and López-Gatius, 2009; Bernadi *et al.*, 2015) have also associated moderate to copious vulva discharge with good fertility outcomes. The considerable quantities (moderate to copious) of vulva discharge observed at both the 8th and 16th hours post synchronization in the cows is therefore expected to support fertility at both hours. In spite of the dis-uniformities, the conception/pregnancy rate observed in this study was higher than in postpartum dairy cows (72%) similarly treated with Ovsynch (Akbarabadi *et al.*, 2014). This may have been so due to the fact that in the present study, multiple insemination was carried out. Unequivocally, our findings among the cows suggest that the dis-uniformity observed in VMR and IVD had zero effect on conception and pregnancy establishment up to 90-day post insemination. While our present findings lend credence to earlier reports that VMR and IVD could be used to predict periods of

fertility in cows, the observed dis-uniformity in trends of VMR and IVD at the 8th and the 16th –hour insemination, which though had zero effect on conception and pregnancy establishment, are worth noting.

Conclusion

The study showed that the status of vaginal mucus resistivity and intenseness of vulva discharge at 8th and 16th hours are not uniform and this dis-uniformity had zero effect on conception and pregnancy.

References

- Ahmed, M., Chowdhury, M. K., Rahman, M. M., Bhattacharjee, J. and Bhuiyan, M. M. U. 2017.** Relationship of Electrical Resistance of Vaginal Mucus during Oestrus with Post-AI Pregnancy in Cows. *Bangl. J. Vet. Med.* Vol 15 (2): 113-117.
- Akbarabadi, M. A., Shabankareh, H. K., Abdolmohammadi, A. and Shahsavari, M. H. 2014.** Effect of PGF_{2α} and GnRH on the reproductive performance of postpartum dairy cows subjected to synchronization of ovulation and timed artificial insemination during the warm or cold periods of the year. *Theriogenology*, 82:509-516.
- Alphonsus, C., Akpa G. N., Barje, P. P., Finangwai, H. I. and Adamu, B. D. 2012.** Comparative evaluation of linear udder and body conformation traits of bunaji and friesland x bunaji cows. *World Journal of Life Science and Medical Research*, 2 (4):134 - 140.
- Beef Research Report 1999.** The Use of a Vaginal Conductivity Probe to

Vaginal-mucus trend dis-uniformity had zero-effect on conception.

- Influence Calf Sex Ratio via Altered Insemination Time. A.S. Leaflet R1652.
- Benbia, S., Kalla, A., Yahia, M., Belhadi, K. and Zidani, A. 2011.** Enzymes activity in bovine cervical mucus related to the time of ovulation and insemination. *International Journal of Biological Biomolecular Agricultural Food and Biotechnological Engineering*. 5:664–666.
- Bernadi, S., Rinaudo, A. and Marini, P. 2015.** Cervical mucus characteristics and hormonal status at insemination of Holstein cows. *Iranian Journal of Veterinary Research (IJVR)*, Vol. 17, Pages 45-49.
- Bisinotto, R. S., Ribeiro, E. S. and Santos, J. E. P. 2014.** Synchronization of ovulation for management of reproduction in dairy cows. *Animal*, 8 (1), 151-159.
- Dunson, D. B., Baird, D. D., Wilcox, A. J. and Weinberg, C. R. 1999.** Day-specific probabilities of clinical pregnancy based on two studies with imperfect measures of ovulation. *Hum. Reprod.* 14(7): 1835-1839.
- Leigh, O. O. 2018.** Handbook of Bovine Rectal Palpation with notes on the Mare for veterinary students. Stirling-Horden Publishers, 1st ed, Pp.45–57.
- Meghen, C., MacHugh, D. E., Sauveroche, B., Kana, G. and Bradley, D. G. 1999.** Characterization of the Kuri Cattle of Lake Chad using Molecular Genetic Techniques. In *The origin and development of African livestock*. R. M. Blench and K.C. MacDonald. (eds.) London: University College Press, Pp. 28 - 86.
- Murugavel, K. and López-Gatius, F. 2009.** Newtonian behavior of the vaginal fluid as a risk indicator of reduced fertility in cows. *Indian Vet. J.*, 86: 1288-1289.
- Pursley, J. R., Silcox, R. W. and Wiltbank, M. C. 1998.** Effect of time of artificial insemination on pregnancy rates, calving rates, pregnancy loss, and gender ratio after synchronization of ovulation in lactating dairy cows. *J. Dairy Sci.* 81:2139-2144.
- Rivera, H., Lopez, H. and Fricke, P. M. 2004.** Fertility of Holstein dairy heifers after synchronization of ovulation and timed AI or AI after removed tail chalk. *Journal of Dairy Science*, 87: 2051-2061.
- Rorie, R. W., Bilby, T. R. and Lester, T. D. 2002.** Application of electronic estrus detection technologies to reproductive management of cattle. *Theriogenology* 57:137-148.
- Subrota, M., Nasrin, S. J., Sattwikesh, P., Mohammad M. H., Jayonta B., Habibur, R. M. and Mohammad R. I. 2017.** Monitoring vaginal electrical impedance in crossbred cows during post-partum period. *Asian J. Med. Biol. Res.* 2017, 3 (2), 221-225.
- Tsiligianni, Th., Karagiannidis, A., Brikas, P. and Saratsis, Ph. 2001a.** Physical properties of bovine cervical mucus during normal and induced by progesterone and/or PGF2alpha

- estrus. *Theriogenology*. 2001a;55:629–640.
- Tsiligianni, Th., Karagiannidis, A., Brikas, P. and Saratsis, Ph. 2001b.** Chemical properties of bovine cervical mucus during normal estrus and estrus induced by progesterone and/or PGF2alpha. *Theriogenology*. 56:41–50.
- Tsuma, V. T. and Leigh, O. O. 2018.** Rectal Palpation for artificial insemination in the cow/heifer. In: Handbook of Bovine Rectal Palpation with Notes on the Mare (O.O. Leigh Eds). Stirling-Horden Publishers Ltd. Ibadan. Pp. 45-57.
- Yamauchi, S., Nakamura, S., Yoshimoto, T., Nakada, T., Ashizawa, K. and Tatemoto, H. 2009.** Prediction of estrous cycle and optimal insemination time by monitoring vaginal electrical resistance (VER) in order to improve the reproductive efficiency of the Okinawan native Agu pig. *Animal Reproduction Science* 113, 311–316.

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