

## Vaginal mucus impedance as an aid for prediction of optimum time for breeding during estrus in cows\*

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### ABSTRACT

Experiment using intravaginal probe with impedance meter was conducted to observe the pattern of vaginal mucus impedance (VMI) during estrus. Fertility rates in cows inseminated with different hours during estrus were analysed to correlate the VMI during insemination with fertility. VMI during estrus was measured 6 hourly for 24 hrs in experimental cows (n=10) with external signs of estrus. During estrus itself there was variation in VMI in different hours. The VMI at 0, 6, 12, 18 and 24 hrs after onset of estrus were  $41.2 \pm 0.76$ ,  $38.5 \pm 1.38$ ,  $33.7 \pm 0.83$ ,  $42.25 \pm 0.85$  and  $50.3 \pm 0.58$  ohms respectively. The lowest VMI was recorded 12 hrs after onset of estrus VMI was significantly lowered from 0 hrs to 6 hrs ( $P < 0.05$ ) and to 12 hrs ( $P < 0.01$ ) while it was significantly increased from 0 hr to 24 hrs after onset of estrus. Chi-square analysis of results shows significant association ( $P < 0.01$ ) between VMI and non-return rates in animals (n = 56) inseminated during estrus with low impedance value (25-34 ohms). There was also the significant association ( $P < 0.05$ ) between VMI and pregnancy rates as detected on day 60 after insemination by rectal palpation.

**Key words :** Cows, estrus, fertility, vaginal mucus impedance

Electrical resistance of vaginal mucus (Phillips *et al.*, 1991) and vaginal epithelial tissue (Feldman *et al.*, 1978) decreased during estrus, a phenomenon that could aid estrus detection by herdsman. Changes in electrical resistance of the fluid of the anterior vagina have been monitored with varying success by means of electrical probes (Edwards and Levin, 1974; Foote, 1975; Gartland *et al.*, 1976; Heckman *et al.*, 1979; Leidl and Stolla, 1976; Sharma *et al.*, 2003). During estrus period itself variation in VMI at different hrs after onset of estrus and lowest impedance value during estrus (heat) were coincided with optimum time for breeding (Leidl and Stolla, 1976; Schams *et al.*, 1977) and lowest electrical resistance value occur within  $\pm 7$  hr to 12 hr of the LH surge (Canfield and Butler, 1989). Successful insemination or profitable dairy farming of cattle depends on accurate detection of estrus and

prediction of proper time for breeding. So the present work was conducted to study the pattern of vaginal mucus impedance during estrus (early, mid and late) and fertility rate in cows inseminated during different hours of estrus and different VMI.

### MATERIALS AND METHODS

Total 10 cows having external signs of estrus were monitored for vaginal mucus impedance (Sharma *et al.*, 2003) 6 hourly from onset of estrus till end of estrus or 24 hrs by using vaginal probe with vaginal mucus impedance meter. Cows (n=56) came to Artificial Insemination Centre for insemination at different hours of onset of estrus were monitored for vaginal impedance and were inseminated. There was follow up of cows after artificial insemination for non return to estrus and were inseminated. There was follow up of cows after artificial insemination for non return to estrus and subsequently pregnancy diagnosis at 60 days post insemination by rectal palpation. The correlation of vaginal mucus impedance at the time of artificial insemination with pregnancy was analysed.

### RESULTS AND DISCUSSION

Vaginal mucus impedance during different hours of onset of estrus recorded in 10 cows is presented in Fig. 1.

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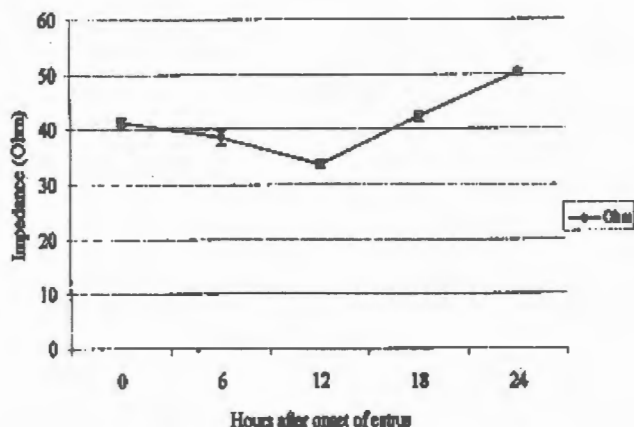


Fig. 1 Vaginal mucus impedance during different hours of estrus

Mean VMI were gradually decreased from onset of estrus and lowest values were recorded 12 hrs after onset of estrus. VMI increased after 12 hrs from onset of estrus to 24 hrs (Fig.1). Significant reduction in VMI was observed on 6 hrs ( $P < 0.05$ ), 12 hrs ( $P < 0.01$ ) after onset of estrus. There was rise in impedance value at 18 hrs which further raised at 24 hrs to significant level ( $P < 0.01$ ) from 0 hrs. Similar trend of decreasing impedance value from onset of estrus to mid estrus and then rise at about 15 hrs before ovulation and further rise at the time of ovulation reported by Scham and Butz (1972). Similarly lowest impedance value was reported during mid estrus (Bostedt *et al.*, 1976; Bobrik *et al.*, 1978; Foote *et al.*, 1978). Bobrik *et al.* (1978) found lowest impedance value at 11.4 hours after first acceptance of mal. Leidl and Stolla (1976) and Schams *et al.* (1977) suggested that lowest impedance values ( $30 \pm 5.7$  ohms) were coincided with optimum time for breeding. Canfield and Butler (1989) made a similar observation that lowest electrical resistance values were within  $\pm 6$  h to  $\pm 12$  h of the LH surge in 89% of the animals. Bobowiec *et al.* (1990) recorded electrical conductivity and reported that sign of estrus were accompanied by significant increase in vaginal mucus impedance. They found lowered electrical conductivity of vaginal mucus at the time of ovulation. Singh and Kharche (1984) also recorded similar findings. The results of association of VMI and pregnancy rate are presented in Fig.2.

Higher nonreturn rates to estrus and pregnancy rates were obtained in animals inseminated during estrus with low impedance value (25 to 34 ohms). Nonreturn rates

were 81.57 and 38.8% in the cows with VMI of 25-34 (low) and 35 and above (high) respectively. Similarly the pregnancy rates based on rectal palpation at 60 days (Fig. 2) post insemination were 63.15 and 33.33% in cows with low and high VMI respectively. The significant association ( $P < 0.01$ ) was found between VMI and nonreturn rates as well as with pregnancy rate ( $P < 0.05$ ). These results are in agreement with the findings of Rofsdal (1974), Rohloff and Patel (1976), Mingazov and Eliseev (1978), Korber (1985), Meena *et al.* (2001). However, Foote *et al.* (1979) reported statistically non significant but apparently higher pregnancy rates in cows inseminated during cow VMI.

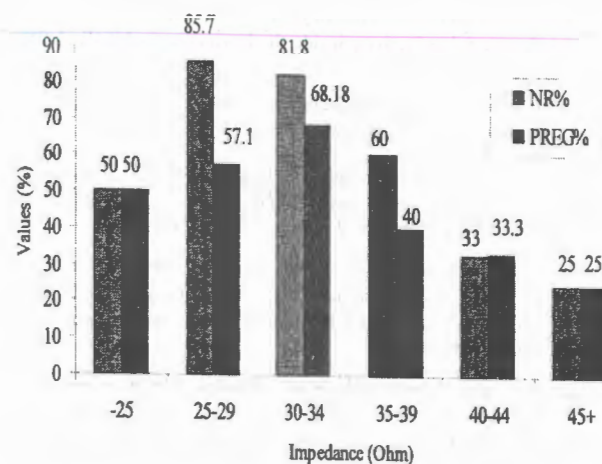


Fig.2 Distribution of impedance values and pregnancy rate

It may be concluded that lowest impedance value by impedance meter during estrus is a efficient method for the prediction of optimum time or artificial insemination or breeding to improve or enhancement the fertility. Higher fertility rates may be achieved by artificial insemination at the time of lowest probe reading using vaginal probe.

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**REFERENCES**

Bobowiec-R., Studzinski-T. and Babiarz, A. (1990). Thermo regulatory effects and electrical conductivity in vagina of cow during oestrus cycle. *Archiv. fur. experimentelle-Veterinarin medizin*, 44: 573-579 (c.f. CAB Abstr, 1990).



- Bobrik, J., Santa-maria, A. and Frey-W-Von (1978). Electroconductivity of genital secretions in cow and heifers. *Ciencia-e-Investigação Agraria*, **5**: 231 (c.f. CAB Abstr., 1978).
- Bostedt, H., Bonengel, H., Gunzier, D., Reissinger, H., Hofer, F. and Brunold, K. (1976). Ovarian changes and measurement of electrical resistance of vaginal secretion in the cow during estrus. *Tierärztliche-Umschau*, **3**: 211-215.
- Canfield, R.W. and Butter, W.R. (1989). Accuracy of predicting the LH surge and optimal insemination time in Holstein heifers using a vaginal resistance probe. *Theriogenology*, **31**: 835-842.
- Edwards, D.F. and Levin, R. (1974). An electrical method of detecting the optimum time to inseminate cattle, sheep and pigs. *Vet. Rec.*, **95**: 416-420.
- Feldman, R., Aizinbud, E., Schindley, H. and Broda, H. (1978). The electrical conductivity inside the bovine vaginal wall. *Anim. Prod.*, **26**: 61-65.
- Foote, R.H. (1975). Estrus detection and estrus detection aids. *J. Dairy Sci.*, **58**: 248-251.
- Foote, R.H., Oltenacu, E.A.B. and Mellinger, J. (1978). Pregnancy rate in dairy cows inseminated on the basis of electrical probe measurements. *J. Dairy Sci.*, **62**: 69-73.
- Gartland, P., Schiavo, Hall, C.E., Foote, R.H. and Scott, N.R. (1976). Detection of estrus in dairy cows by electrical measurements of vaginal mucus and by milk progesterone. *J. Dairy Sci.*, **59**: 982-985.
- Heckman, G.S., Katz, L.S., Foote, R.H., Oltenacu, E.A.B., Scott, N.R. and Marshall, P.A. (1979). Estrous cycle patterns in cattle monitored by electrical resistance and milk progesterone. *J. Dairy Sci.*, **62**: 64-68.
- Korber, A. (1985). Systematic effects on the results of first insemination of German Simmentals with particular reference to insemination time and technicians. *Tierärztliche*, **17**: 160 (c.f. CAB Abstr., 1987-89).
- Leidl, W. and Stoll, R. (1976). Measurement of the vaginal mucus as an aid for heat detection. *Theriogenology*, **6**: 237.
- Meena, R.S., Sharma, S.S. and Purohit, G.N. (2001). Efficiency of vaginal electrical resistance measurement for estrus detection and insemination in Rathi cows. XVIIth Annual Convention and National Seminar on Fertility Management of Farm Animals under Adverse Agro-climatic Conditions. Oct. 6-8th, 2001. Jodhpur, Abstr. Souv., pp 26-27.
- Mingazov, T.A. and Eliseev, N.P. (1978). Relationship of conception rates of cows with time of insemination during oestrus. *Vestnik-sel' Skokhozyaistvennoi-Nauki-Kazakhstan*, **21**: 74-76 (c.f. Abstr., 1979-81).
- Phillips, C.J.C., Schofield, S.A. and Owens, A.R. (1991). Variation in milk production, activity rate and electrical impedance of cervical mucus over estrus period of dairy cows. *Anim. Reprod. Sci.*, **24**: 231-248.
- Pierson, R.A. and Ginther, O.J. (1984). Ultrasonography of the bovine ovary. *Theriogenology*, **21**: 495-504.
- Rofsdal, A.O. (1974). Measuring electrical resistance of vaginal mucus in inseminated cows. *Norsk-Veterinaertidsskrift*, **86**: 538-541 (c.f. CAB Abstr., 1972-75).
- Rohloff, D. and Patel, B. (1976). Chronological relationship between sign of oestrus, the electrical resistance of the vaginal mucosa, pre ovulatory excretion of luteinizing hormone and ovulation in cattle. *Zuchthygiene*, **7**: 49-56 (c.f. CAB Abstr., 1972).
- Schams, D., Schallenberger, E., Hoffmann, B. and Karg, H. (1977). The estrous cycle of the cow hormonal parameters and time relationship concerning estrus, ovulation and electrical resistance of the vaginal mucus. *Acta-endocrin*, **81**: 180.
- Sharma, P., Tiwari, R.P., Mishra, O.P. and Singh, M. (2003). Interrelationship between vaginal mucus resistance, ovarian cycle and fertility in cows. *Indian J. Anim. Sci.*, **73**: 23-27.
- Singh, M.M. and Kharche, K.G. (1984). Physio-biochemical attribute of cervico-vaginal mucus in crossbred cows. *Cherion*, **13**: 58-61.
- Rao, A.V.N. (1991). Use of intravaginal electrical resistance patterns and milk progesterone profiles as monitors of reproductive status in cows. *Indian J. Anim. Reprod.*, **12**: 19-22.
- Rao, A.V.N., Palmer, W.M. and Sheikheldin, M.A. (1989). Gonadotropin releasing hormone induced oestral, hormonal and vaginal resistance changes and their temporal relationships in anestrus cows pretreated with and without beta oestradiol. *Indian Vet. J.*, **66**: 1137-1140.
- Snedecor, G.W. and Cochran, W.G. (1989). *Statistical Methods*. 8th edn., The Iowa State Univ. Press, Ames, Iowa, USA.