Haryana Vet. (Dec., 2018) **57 (2)**, 226-228

Short Communication

COMPARATIVE EFFICACY OF CEFTIOFUR SODIUM, GENTAMICIN SULFATE AND *ZINGIBER OFFICINALE* ON PHYSICAL CHARACTERISTICS OF CERVICAL MUCUS IN ENDOMETRITIC BUFFALOES

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Received: 01.09.2018; Accepted: 24.09.2018

SUMMARY

The present study aimed to investigate the comparative therapeutic efficacy of ceftiofur sodium, gentamicin sulfate and *Zingiber officinale* extract on cervical mucus of clinical endometritic buffaloes. The endometritic affected animals were randomly allotted to five groups namely, Group I, II, III, IV and V comprising of ten animals in each group. Nature of cervical mucus, White side test and pH of cervical mucus were analysed pre and post treatment in each group. The characteristics of cervical mucus differed significantly between normal cyclic and endometritic buffaloes. The findings indicated that cervical mucus is an important tool for diagnosis as well as recovery assessment for endometritis in buffaloes.

Key words: Ceftiofur, Cervical mucus, Endometritis, Gentamicin, *Zingiber officinale*

Endometritis is inflammation of the endometrial lining of the uterus and formation of mucopurulent secretion. It is a major cause of repeat breeder syndrome of bovines. Unlike metritis, it does not affect the general health. Therefore, it has a major economic impact by poor conception rate, increasing calving interval, reduction in calf crop, increased cost of treatment, decreased milk yield and increased culling rate. Endometritis may be due to various factors *viz.* dystocia, retained foetal membranes (RFM), caesarean section, contamination of uterus at the time of artificial insemination or natural insemination, induced parturition, stillbirth, twins, ovarian inactivity, cystic ovaries, unhygienic calving environment and metabolic disorder associated with parturient metabolic disorders (Noakes *et al.,* 2002).

The physical characteristics of cervical mucus are important tools to diagnosis as well as assessment of recovery from endometritis in buffaloes. Physical characteristics of cervico-vaginal mucus/estrual discharge also have a direct effect upon the fertility and conception rate of the animals (Rangnekar *et al.*, 2002). According to Zain *et al*. (1997) increased enzymatic activity in the uterine flushing could be diagnostic criteria in the assessment of the intensity of endometritis. Increased pH in cervical mucus has been observed in repeat breeder animals as compared to normal cyclic animals. Chronic endometritis in buffaloes are reported to be characterized by purulent alkaline vaginal discharge, which returns to normal after successive treatment (Singh *et al.,* 2009). The present study aimed to investigate the comparative therapeutic efficacy of ceftiofur sodium, gentamicin sulfate and *Zingiber officinale* extract on cervical mucus of clinical endometritic buffaloes.

The Buffaloes affected with endometritis brought for treatment to Instructional Dairy Farm Complex, Teaching Veterinary Clinical Complex, Veterinary hospitals lying adjacent to Kumarganj, Faizabad, and Buddeyshwaran, Lucknow (U.P), India were selected for study. *Zingiber officinale* extract was prepared in Soxhlet apparatus as per standard method and then concentrated in vacuum rotary evaporator at 40°C for ethanol removal. One gram concentrated extract was mixed in double distilled water in floor shaker water bath used for intrauterine therapy. The buffaloes were divided into five treatment groups namely, normal cycling healthy estrus buffaloes (Group I), animals recommended for sexual rest up to one reproductive cycle (Group II), Gentamicin sulfate 400 mg intrauterine daily for three days (Group III), Ceftiofur sodium 500 mg intrauterine daily for three days (Group IV) and one gram extract of *Zingiber officinale* (dissolved in 50 ml of distilled water) intrauterine daily for three days (Group V).

Estrual cervical mucus from all the animals was collected at 8 to 12 hours after onset of behavioural oestrus as described by Dhillon *et al.* (2006). The vulvar and perineum region were washed with antiseptic solution and wiped properly with absorbable sterile cotton. The internal genitalia were massaged (per rectum) and mucus flown out was collected in sterilized disposable petridish.

Two ml cervical mucus was mixed with 2 ml volume of 5% sodium hydroxide (NaOH) solution in a test tube and boiled for few minutes. The appearance of light yellow or the dark yellow, colour was taken as a positive indication of endometritis (Popov, 1969). Samples showing no colour change after boiling were considered as negative i.e. free of endometritis.

Cervical mucus was found to be mucopurulent or hazy in all affected animals. Whereas, after successive treatment, animals showed 0%, 80%, 100% and 70% clear cervical discharge in group II, III, IV and V, respectively (Table 1). The animals which were recommended for sexual rest up to one reproductive cycle didn't expressed any clinical sign of improvement. Gentamicin treated

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Table 1

Effect of Gentamicin sulfate, Ceftiofur sodium and *Zingiber officinale* extract on cervical mucus in endometritic buffaloes

Sl. No.	Parameters	Regular cyclic (Group I)	Repeat Breeder (Group II)		Treatment Groups (%)					
					Gentamicin sulfate (Group III)		Ceftiofur sodium (Group IV)		*Zingiber officinale* (Group V)	
1.	Nature of cervical mucus	Pre	Pre	Post	Pre	Post	Pre	Post	Pre	Post
	Mucopurulent	0	6 (60)	6 (60)	5 (50)	2 (20)	4 (40)	0	5 (50)	3 (30)
	Hazy	0	4 (40)	4 (40)	5 (50)	0	6 (60)	0	5 (50)	0
	Clear	10	0		0	8 (80)	0	10 (100)	0	7 (70)
2.	White side test									
	A. Positive	0	10	10	10	2	10	0	10	3
	Dark yellow	0	5 (50)	6 (60)	5 (50)	1 (10)	4 (40)	0	5 (50)	2 (20)
	Moderate yellow	0	2 (20)	1 (10)	3 (30)	1 (10)	2 (20)	0	2 (20)	1 (10)
	Light yellow	0	3 (30)	3 (30)	2 (20)		4 (40)	0	3 (30)	0
	B. Negative	10	0	0	0	8 (80)	0	10 (100)	0	7 (70)
3.	pH of cervical mucus (Mean ±SE)	7.00±0.25***	7.99±0.93	7.98±0.08	7.96±0.07	7.07±0.14***	7.95±0.05	6.93±0.03***	7.98±0.04	7.14±0.11***

* Significant at 5% ** Significant at 1 % *** Significant at 0.1%

group animals mucus was clean, mucopurulent and hazy in 80%, 20% and 0% animals, respectively, whereas, Ceftiofur treated buffaloes showed 100% clear cervico-vaginal discharge. 70% of *Zingiber officinale* extract treated buffaloes showed clear mucus, whereas 30% had mucopurulent cervico-vaginal discharge.

After Gentamicin treatment, 80% buffaloes were found clinically healthy. Similar findings are also reported by Azawi *et al.* (2008). Higher recovery was observed by Kavani *et al.* (1985) and the lower response was reported by Dutt *et al.* (2017). The recovery rate in Ceftiofur sodium treated group was higher than the Gentamicin sulfate and *Zingiber officinale* extract treated groups that might be due to the broad efficacy of Ceftiofur sodium on both Gram-negative and Gram-positive bacteria and its resistance to antibiotic resistance enzyme beta-Lactamase enzyme (Chenault *et al.,* 2004).

White side tests were performed with cervical mucus samples collected from pre and post treated animals (Table 1). Colour of precipitate was recorded as positive with dark yellow, moderate yellow and light yellow. The expression of colour varied depending upon infection in the uterus and neutrophil infiltration and metrorrhagia which was normally seen during estrogen dominance (Ohtani *et al.,* 1993).

The pH of cervical vaginal mucus was analysed (Table 1). The mean pH values in all treatment groups reduced significantly ($p<0.01$). The pH of CVM is in agreement with the reports of Singh *et al.* (2009) and Kumar *et al.* (2011). The reduction in pH of cervical mucus after treatment is a sign of homeostasis. The pH of Cervico-vaginal mucus in all groups in the present study was higher than that of Kumar *et al.* (2013) who also reported a significant reduction in pH of endometritic buffaloes from 7.5 to 6.8. In normal healthy buffaloes, the pH value of CVM at the time of oestrus is slightly alkaline and near to neutral. The pH of CVM indicates the status of the uterine environment existing at the time of oestrus and fertilization. Acidic or excessive alkaline pH of CVM reduces the sperm motility, thereby causing failure of fertilization. The pH value more than 8.5 is reported to be associated with infertility and indicative of uterine infection (Kumar *et al.,* 2013). The difference in the mean pH values of cervico-vaginal mucus at pre and post treatment stage in all treatment groups might be due to the bacterial metabolites and inflammatory exudates (Salphale *et al.,* 1993), their mechanism of action and breed difference. Also, the pH of cervical mucus increases during its exposure to air due to the loss of CO_2 (Eggert-Kruse *et al.,* 1993). pH drops towards the neutral side, once the infection from uterus is eliminated (Markusfeld, 1984).

Negative wide side test was reported as 80%, 100%, and 70% in group III, IV and V, respectively. Ceftiofur @ 500 mg/IU is more effective than Gentamicin sulfate and extract of *Zingiber officinale* to control endometritis in buffaloes. Based on present finding it is concluded that commercially available antibiotics (Gentamicin sulphate and Ceftiofur sodium) and dried extract of *Zingiber officinale* are efficient for control of endometritis. *Zingiber officinale* (ginger) extract may prove as low cost remedy for therapeutic management of endometritis affected repeat breeder buffaloes and can also be utilized for treatment of uterine infections in animals reared for organic milk production program in buffaloes and possibly in cows also.

ACKNOWLEDGMENTS

Authors thank Dean, College of Veterinary Science & Animal Husbandry, Kumarganj, Faizabad for providing essential facilities and support.

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