A Device for Detection of Heat in Heat-Silent Buffaloes

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Abstract. The chloride content of buffalo cervical mucus reached a maximum level of 632.4 mg/100 ml at the time of oestrus.

A test was developed for the detection of oestrus in buffaloes. It was based upon changes in the chloride content of cervical mucus. Since it was simple and rapid, it could be done by attendants in the field. It was recommended as a routine test on a farm where silent heat was predominant among buffalo cows.

The buffalo-cow occupies a very prominent position among the farm animals in Egypt and is one of the most important sources of the national income. It has been, however, suffering from infertility. This major problem has been dealt with by a number of research workers from different points of view. Nevertheless, silent heat still remains as one of the greatest problems on the reproduction of buffaloes.

Hafez [10] reported that the symptoms of heat were less intense in buffaloes in Egypt than in cows, that there was no homosexual activity, that the flow of oestrous mucus from the vulva was less marked, that silent heat occurred in 36% of the oestrous cases, and that about 30% of the oestrous cases occurring after calving was silent. He also reported that the onset of oestrous took place during a period from 6 p.m. to 6 a.m. in 84% of the oestrous cases observed. In such conditions many oestrous cases may have passed unnoticed and might well be regarded as anoestrous ones. Two successive silent oestrous periods were observed in 11% of the oestrous cases examined. In addition, silent heat was

found at a significantly high frequency among buffalo cows in Egypt [7, 8, 16, 20] and India [13, 14, 17].

The physiology of the oestrous cycle, as well as the character of the cervico-vaginal mucus, was studied in buffalo cows in Egypt [10, 18, 21, 22].

The following attempts have been made for the detection of heat in cattle. (a) Observation was done two or three times a day, with or without a vasectomized bull. (b) Heat mount detectors or bulls harnessed with a saddle or paint-filled sponge were used. (c) Daily smearing was done on a bull with titanium dioxide and peanut oil and observation on cows three times a day for marking [2, 3, 4, 11]. No methods of heat detection, however, have been applied to heat-silent buffaloes ever before.

The present investigation was carried out to study the chloride content of the cervico-vaginal mucus of buffaloes and its changes with the different phases of the oestrous cycle. These changes were utilized for the development of a simple field test to recognize the time of heat especially in heat-silent animals.

Table 1. Variations in the chloride content of the buffalo cervical mucus

Phase of cycle	No. of samples (Min)	Mean*	Standard Deviation min.	Range*	
				Min.	Max.
Proestrus	28	411.7	22.1	392.0	430.3
Oestrus	52	632.4	35.3	606.7	668.5
Metoestrus	17	318.9	15.5	304.6	341.5
Dioestrus	26	295.6	21.4	255.8	283.4

Remarks.

*: mg/100 ml NaCl

Materials and Methods

A total of 123 samples of cervico-vaginal mucus were collected from healthy Egyptian buffalo cows at different stages of the oestrous cycle. They had been collected by means of a tampon introduced into the most anterior part of the vagina close to the cervix after thorough cleaning and disinfection of the external genitalia. Gynaecological examination was carried out to determine the stage of the cycle. The chloride content of the mucous sample was estimated by the titrimetric method of Schales and Schales [19]. It was expressed in terms of mg per 100 ml of sodium chloride.

For the spot test, samples were collected from three buffalo cows kept at the clinic of the author's Department every day through two complete cycles by means of a wooden stick about 40 cm long to which a small piece of cotton was attached. The stick was introduced into the vagina by the aid of a speculum and rotated gently two or three times to wipe the mucosal surface. A very thin portion of the mucous sample was applied to a piece of oestrous cycle spot test paper (Fig. 1). This test paper had been prepared from a piece of chromatography paper Whatmann No. 1 by immersing in a mixture of 0.275 N silver nitrate and 0.175 N potassium chromate solution, allowed to dry, and divided into 22 divisions beginning with the division representing the day of oestrus. When a smear of mucus was applied to this paper, the color of the paper changed within a few seconds. A spot white to buff in color appeared. The intensity of such color varied according to the chloride content of the mucous sample.

Results

The chloride content of buffalo cervical mucus during the different stages of the oestrous cycle is shown in Table 1. The highest chloride content was reached at the

time of oestrus. It ranged from 606.7 to 668.5 mg/100 ml of mucus, or 632.4 ± 35.3 on the average. The lowest chloride content was shown on different days in the dioestrous phase. It ranged from 255.8 to 283.4 mg %, or 265.6 ± 21.4 on the average. Oestrus was also indicated by the intensity of white color that appeared at the time of oestrus, as compared with the buffy spot which appeared the stage of dioestrous (Fig. 1). The reliability of this spot test has been evaluated in the determination of the chloride content of cervical mucus. No statistically significant difference was found in the chloride content determined between this test and the potentiometric titration procedure [6].

Discussion

The chloride content of buffalo cervical mucus appears to be higher at the stage of oestrus than at any other stage of the cycle. It is markedly lower than that of bovine cervical mucus at the same stage of the cycle [5, 6].

The change in the chloride content of cervical mucus is directly related to and coincides with the follicular maturation and the production of oestrogens in the animal examined. The intramuscular injection of stilbestrol (4–20 µg) is followed by a rise in the mean chloride content of the cervical mucus of ovariectomized ewes after 24 hours [23].

The typical fern-like crystallization was demonstrated in dried smears of the cervical mucus of buffaloes at the stage of oestrus [22]. It always goes with a rise in the chloride content at this stage. McDonald [15] found that the crystals of dried cervical smears were composed almost entirely of sodium and potassium chloride.

The spot test of the oestrous cycle can be carried out by attendants or herdsmen in the barn at the time of milking. A very thin smear of cervical mucus is spotted daily in the consecutive divisions on a piece of silver chromate paper. When an intense white color appears, it is taken as an indication of the day of oestrus. It is of particular importance to detect the time of oestrus especially among animals suffering from suboestrus or silent heat. Accordingly, a high conception rate can be insured by recognizing the optimum time for insemination. Studies are currently underway along this line.

No physiological basis is known for the failure of the typical symptoms of oestrus to accompany ovulation. This failure may

be due to lack of sufficient secretion of estradiol by mature and secondary follicles or due to a need for such threshold of oestrogen in certain individuals as sufficient to produce the nervous symptoms characteristic of oestrus. Lagerlöf [12] expressed an opinion that some breeds of cattle might have a hereditary predisposition for weak oestrus and others for marked oestrus. Schmidt et al. [20] stated that in buffaloes the disappearance of heat symptoms might be due to the anovulatory condition of the Graafian follicle or due to lack of secretion of oestrogens or both. Abdo [1] found that the level of free oestrogen in the buffalo blood was $166 \mu\text{g}$ per liter of serum during oestrus and that the ratio of oestrogen to progesterone in the blood at that time was 1:0.68. These values are markedly smaller than those of cows at the stage of oestrus. Abdo [1] and Wrenn et al. [24] suggested that the synergistic action of oestrogen and progesterone might intensify the symptoms of heat in heat silent animals.

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