

RELATIONSHIP BETWEEN ELECTRICAL RESISTANCE OF VAGINAL MUCUS IN THE MOMENT OF INSEMINATION AND COW'S PREGNANCY RATE

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SUMMARY: This paper presents our results about the relationship between vaginal mucus electrical resistance values at the time of insemination and achieved cow's pregnancy rate. We examined total of 130 cows, divided into three groups, based on the values of vaginal mucus electrical resistance (less than 179, from 180 to 320 and more than 321 units). Our three groups of cows achieved pregnancy rates of 87,5%, 73,6% and 75%, respectively. Pregnancy rate for all examined cows was 74,6%. The obtained results in this study showed that there was no statistically significant difference in pregnancy rate among analyzed groups.

Key words: vaginal mucus, electrical resistance, pregnancy rate, cow.

INTRODUCTION

Oestrus, as the most visible phase of the oestrous cycle, is characterised by nervousness, roaring, mounting activity, standing to be mounted by another cow, reduced milk production and food refusing. In addition to these, relatively insecure signs, appearance of the vaginal mucus is considered to be the most characteristic sign of oestrus. (Miljković and Veselinović, 2000; Matarugić et al., 2007). This phase of cycle is characterized by follicular maturation and ovulation and by proliferation of endometrial mucosa and its preparation for the acceptance of early embryos. Along with changes in ovaries and uterine mucosa, cyclical changes are occurring also in cervix, with opening of cervical canal to facilitate sperm transport and secretion of cervical mucus as a medium in which the spermatozoa move (Miljković and Veselinović, 2000; Stančić and Veselinović, 2002). All these events are controlled by the neuroendocrine system of animal. During oestrus, the cervical canal is open, relaxed and filled with oestrous mucus. Oestrous mucus is a product of cervical canal glands and fills cervix during oestrus, than pass through vagina and vulva and expands in the form of long threads

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(Matarugić et al., 2007). Vaginal mucus, except epithelial cells and substances necessary for the survival of sperm, also contains electrolytes (salts of sodium, magnesium, calcium and other cations), which determine its electrochemical reaction. Electrolytes in smears of oestrous mucus can be observed as crystals (Miljković, 1990). During the various stages of oestrous cycle and oestrus itself, certain changes are occurring in composition and relationship of some electrolytes in oestrous mucus. The presence of electrolytes leads to ionization of oestrous mucus, which also affects its electrical conductivity. Based on these characteristic of oestrous mucus, method for determining the electrical resistance of oestrous mucus is been developed, as a method for detecting the optimum time for insemination or mating (Carter and Dufty, 1980; Elving et al., 1983; Fossen, 1991; Rorrie et al., 2002). With changes in composition of oestrous mucus, there are parallel changes in electrical resistance, which represents the base of this diagnostic method. During oestrus, the electric resistance of oestrous mucus decline (Tasal et al., 2005). In the next period, value of resistance increase, which indicates that the moment of ovulation is approaching. Firk et al. (2002) report that some pathological conditions of the reproductive tract, such as vaginitis and cervicitis, can give a values of electrical resistance of vaginal mucus similar to those in oestrus.

This study aims to determine the connection of pregnancy rate and values of electric resistance of the vaginal mucus at the time of insemination.

MATERIAL AND METHODS

The examination included a total of 130 cows of domestic mix-breed in Simmental breed type, aged 3 to 16 years, in breeding condition, with an average parity of 5,13 (1-13) calvings. The average length of service period of inseminated cows was 80,62 days (30-135). The cows were inseminated on average 9,32 (3-20) hours after the first observed signs of oestrus. At the time of insemination oestrous mucus was observed in 46% cows.

To determine the values of electric resistance of the vaginal mucus oestrous detector Draminski (Olsztyn, Poland) was used. The value of the electric resistance of the vaginal mucus was determined as the average value of three measurements taken immediately prior to insemination. According to the manufacturer of oestrous detector, oestrus occurs when the value of resistance is about 180 units, and ovulation occurs about 24 hours later, when the value of resistance begins to grow closer to 320 units. In accordance with the manufacturer's recommendations, all examined cows were divided into three groups. The first group consisted of cows with values of the electric resistance of vaginal mucus less than 179 units, in second group were cows with values from 180 to 320 units, and third group were cows with values higher than 321 units. All cows were inseminated by bimanual method, and the gravidity was confirmed by rectal examination 9-12 weeks later. Repeat breeding cows were not the subject of further research.

RESULTS

The values of the electric resistance of vaginal mucus in examined cows at the time of insemination are shown in Table 1.

Table 1. The values of the electric resistance of the vaginal mucus at the time of insemination
Tabela 1. Vrijednosti otpora vaginalne sluzi u momentu osjemenjavanja

<i>Group / Grupa</i>	n	X±Sx	±S	IV	CV
<i>First / Prva</i>	8	162,9±5,04	14,27	140-176,7	8,76
<i>Second / Druga</i>	110	240,5±3,53	37,08	180-320	15,42
<i>Third / Treća</i>	12	404,7±28,61	99,13	326,7-650	24,49

Pregnancy rate and its relation to the values the electric resistance of vaginal mucus at the time of insemination is shown in Table 2.

Table 2. Pregnancy rates in relation to the values of resistance of vaginal mucus at the time of insemination

Tabela 2. Procenat graviditeta u odnosu na vrijednost otpora vaginalne sluzi u momentu osjemenjavanja

<i>Group / Grupa</i>	<i>Inseminated cows Osjemenjene krave</i>		<i>Pregnancy rate Procenat graviditeta</i>	
	n	%	n	%
<i>First / Prva</i>	8	6,2	7	87,5±11,69 ^a
<i>Second / Druga</i>	110	84,6	81	73,6±4,20 ^a
<i>Third / Treća</i>	12	9,2	9	75±12,5 ^a
<i>Total / Ukupno</i>	130	100,0	97	74,6

^{a,b,c} Values with different superscripts within column are significantly different ($P<0,05$).

Vrednosti sa različitim superskriptima su signifikantno različite ($P<0,05$).

In the first group of cows average value of the electric resistance of the vaginal mucus at the time of insemination was 162,9±5,04 units. Pregnancy rate in this group cows was 87,5%. An average value of the electric resistance of the oestrous mucus in the second group of cows was 240,5±3,53 units, with pregnancy rate of 73,6%. The third group of cows had an average value of the electric resistance of the oestrous mucus 404,7±28,61units, with pregnancy rate of 75%. Pregnancy rate for all observed cows was 74,6%. The obtained results in this study showed that there was no statistically significant difference in pregnancy rate among analyzed groups.

DISCUSSION

Intensive selection for milk production negatively affected the reproductive efficiency of high yielding dairy cows. Oestrus detection is a common problem on farms or in households that kept dairy cows. The reasons for that are insufficiently pronounced signs of estrus, and lack of producers knowledge. Therefore, a series of studies were conducted to find instrumental or other method which would successfully determine the optimum time for insemination or mating. Potential solution for overcoming these problems is a oestrus detection device, used in our study.

Fossen (1991) found a positive correlation between the value of vaginal mucus resistance and progesterone concentration in milk, as a diagnostic method to detect the optimal moment for insemination. McCaughey and Patterson (1981) found a connection between the value of vaginal electrical resistance, the level of progesterone in milk and

observed signs of oestrus. The values of the vaginal mucus resistance of cows and heifers were significantly correlated with the concentration of progesterone in gravid and non-gravid cows. McCaughey (1981) noted positive experiences with measuring the electrical resistance of vaginal mucus, while Cavestany and Foote (1985) described this method as insufficiently reliable in large farms conditions. Zuluaga et al. (2008) concluded that this method is not reliable in detecting the optimum time for insemination after induction and synchronization of ovulation in cows.

Elving et al. (1983) state that the method of measuring electrical resistance of vaginal mucus is not effective in oestrus detection, due to variations in consecutive oestrus and between the animals in the same phase of oestrous cycle. Kitwood et al. (1993) state that, when using a method of measuring resistance of vaginal mucus in cows, it is needed to determine the lowest value of resistance of vaginal mucus. According to results of Carter and Dufty (1980) the method of measuring resistance of vaginal mucus is not suitable for the detection of the optimal moment for insemination, because the recorded lowest values of resistance varied between animals in different times of oestrus. Leidl and Table (1976) observed a clear correlation between the value of resistance of vaginal mucus and phase of oestrous cycle. According to these authors, the lowest values of resistance were found during oestrus. The same authors found that ovarioectomised animals showed no change in values of resistance, as a result of the absence of hormonal regulation of mucus secretion. According to these authors, disadvantage of this method is that some pathological conditions of genital tract can give values similar to those observed during oestrus. On this basis, they state that the diagnosis of estrus and the optimum time for insemination can not be based solely on the determination of resistance of vaginal mucus, but it should serve as an auxiliary method. The same authors found that pregnancy rate was 82% in cows with vaginal mucus resistance values less than 300 units. The value of electrical resistance of vaginal mucus was lowest during estrus and increases during dioestrus, which confirmed the results of Tasal et al. (2005). According to Fossen (1991), the best conception is achieved, when cows were inseminated within 12 hours after the established minimum value of resistance of vaginal mucus. Although they found different values of resistance of vaginal mucus, Foote et al. (1979) have achieved the same pregnancy rates group of cows which were inseminated following a value of resistance, and the other group using a common visual method for detecting of oestrus. Aboul-Ela et al. (1983) have shown that resistance of vaginal mucus fluctuated during dioestrus, with marked decline (25%) during oestrus. The lowest value of resistance was observed in the second half of oestrus, which coincides with the peak of LH.

Soto (2008) using Draminski oestrus detector, found that the lowest value of resistance of vaginal mucus at oestrus was average 181 units, while in subsequent stages of oestrus cycle values was increased, ie during postestrus the value of resistance 214, proestrus 239 and in dioestrus 254 units. Kostov et al. (1984) showed that the optimum time for insemination of cows is in the period when the vaginal mucus resistance is less than 250 units. Our results are consistent with the findings of these authors, as confirmed by the fact that the highest pregnancy rate was established in cows with the lowest value of resistance of vaginal mucus.

CONCLUSION

Timely and accurate oestrus detection is the basis for managing the reproductive performance of cows. One of the methods for estrus detection is the measurement of resistance of vaginal mucus. By monitoring of values of vaginal mucus resistance, we can determine the stage of oestrous cycle. In our study we found that the largest pregnancy rate was established in the cows with the values of resistance less than 179 units. However, differences in the pregnancy rate of analysed groups were not statistically significant. In order to investigate the efficacy of this method further research is needed.

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POVEZANOST ELEKTRIČNOG OTPORA VAGINALNE SLUZI U MOMENTU OSEMENJAVANJA I PROCENTA GRAVIDITETA KRAVA

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Izvod

U radu su predstavljeni rezultati istraživanja povezanosti vrednosti električnog otpora vaginalne sluzi krava u momentu osemenjavanja i ostvarenog procenta graviditeta. Ukupno je ispitano 130 krava koje su na osnovu vrednosti električnog otpora vaginalne sluzi podeljene u tri grupe (manje od 179, od 180 do 320 i više od 321 jedinice). U prvoj grupi krava ostvaren je procenat graviditeta od 87,5%, u drugoj 73,6% i trećoj 75%. Procenat graviditeta za sve ispitane krave bio je 74,6%. Nije ustanovljena statistički značajna razlika u procentu graviditeta između ispitanih grupa krava.

Ključne reči: vaginalna sluz, električni otpor, procenat graviditeta, krava.

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