INSEMINATION INDEX AND FERTILIZATION SUCCESS IN HOLSTEIN`S CATTLE RACE AFTER RETENTION OF THE PLACENTA

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ABSTRACT

Reproductive capabilities are significant economic characteristics and they are given special attention and strives to maintain at a satisfactory level or even improve by different zootechnical measures. Reproduction in Holstein cows is an introduction to production and are indirectly linked, and better reproductive characteristics in cows also give positive economic effects. Significant reproductive characteristics are the index of insemination and the success of insemination after calving. The research work was based on proving the effect of residual placenta and its retention on the mentioned reproductive properties. The first group of cows X_1 consisted of cows with normal calves and numbered 34 cows, and were characterized by on time plunged placenta, with an average index of insemination of 1.2. The insemination index in the group of cows X_2 containing 20 cows with residual placenta, and where reteniting of placenta was up to 30 hours after calving, was 2.1. The largest oscillation index had a group of cows X_3 that counted 14 heads, where the placenta retention was made after 30 hours from the calving moment with a 4.86 index. Detailed analysis of the insemination index showed the data for the success rate of insemination, for the group X_1 from the first attempt was 79.41% and from the second was 20.59%. Group X_2 has an insemination performance for the first attempt of 45.0%, the second attempt was 30.0%, the third 10.0% and the fourth was 15.0%. Cows that have placental retention after 30 hours of calving, X_3, the success rate of insemination is very low, and for the first attempt it was

14.3%, the second and the third to 7.15% while for the fourth and subsequent attempts was 50.0%. The best reproductive indicators had a group of cows with normal calves and calves removed on time.

KEY WORDS: index of insemination, placenta retention, success of fertilization.

INTRODUCTION

Cows intended for high milk production were created by the selection work of man. Heads with a genetic potential for high milk production should be placed in adequate conditions, with the aim of expressing their genetic potential. It is primarily meant on nutrition quality, adequate accommodation and veterinary protection. With the increase in milk production in cows, there was a decline in reproductive abilities, primarily the occurrence of silent estrus, an increased insemination index after partus, lower performance in insemination and a longer intracalving interval. The normal calving flow in cows implies the correct position of calf when leaving the reproductive channel and the placenta removed at a time. At some cows, from 5 to 10% cows after calving, the placenta is lagging behind, and the removal must be done manually. A placental lagging disorder greatly increases the cost of treatment, reduces the amount of milk produced, fertility, and thus increases the cost in the dairy industry (Miljkovic, 1984). Recent research suggests that these have multi-causes, that is, that several factors influence the occurrence of postpartum lagging (Grunert, 1984; Pursley, 2004; Laven et al 1996). One of the biggest problems after the restoration of the fallen placenta is the onset of endometritis, which have a direct impact on the further reproductive ability of the cows. Prophylaxis is generally concentrated on improving nutrition and keeping. In cows with residual placenta, a deficiency of prostaglandin (PGF2α) was detected.

Contemporary cattle breeding implies, for many reasons, justified artificial insemination. Artificial insemination plays a major role in improving the breed composition of the herd. Breeding progress, selection success in one year, under conditions of organized selection and reproduction is 0.5 - 1.5% of the average production of a population. The effect is reflected in the improvement of the racial and production traits of the cows in fertilization by 30% over the population average, which is a great credit to the bull-fathers. The efficiency of artificial insemination is expressed by an index representing the average number of inseminations required in one herd of cows, and success by the percentage of fertilization from the first

insemination is determined by rectal examination of the cows 6-8 weeks after insemination (Miljkovic, 1976).

According to some Anglo-Saxon authors, the natural mating index is 1.5 -1.7 (the average number of jumps required to keep a cow pregnant). Of the paired cows, 60-75% remain pregnant from the first jump. The artificial insemination index was normally 1.48 -1.52 or 63.9-65.6% for the first insemination (Eibl, 1959). Fertilization of cows from natural mating is 75%, while in artificial insemination it is 66%. This happens solely because bulls mates exclusively cows in estrus, and artificial insemination can be done too soon or too late (Miljković, 1976).

The success of insemination is determined by the percentage of cow fertility success from the first time (Miljković, 1976). Good insemination results are achieved due to timely insemination moment in the oestrus. Foote (1979) says that in cows that started with sexual heat in the evening and were inseminated the next day until 2 pm, the success rate was 67.4%, while in those inseminated after 14 hours, it was lower (63.8%). The optimal time for successful insemination is a period of 10-18 hours from the start of estrus for almost all cows: both for those who have experienced estrus in the evening and for those who have experienced estrus in the morning. Torre (1982), Trimberger and Davis (1943) recommended that the insemination period should be determined 6-24 hours after the onset of oestrus.

In a study conducted on a group of 34 cows treated with bedding, 3 or 8.85% cows failed to conceptualize successfully, where the length of service period in some cases lasted over 350 days (Novakovic et al., 2010).

The aim of this study is to determine, on the basis of the results obtained in the groups of monitored animals, under the same production conditions on a large farm, the effect of the lag of the placenta and its removal time on the insemination index and the success of the insemination.

MATERIALS AND METHODS

In order to determine the reproductive indices of the cows, Holstein-Friesian breeds in an intensive milk production system were monitored on the farm. The cows on the farm are divided into production groups, depending on the status they are in: cows before calving (dry period early and late), production group (lactation) has more subgroups depending on the stage of production and groups of cows in puerperium and full production. There is central software on the farm that records the increased daily movement of the cows, and based on the

collected results it is possible to determine more precisely which cows are in the oestrus, which facilitated the collection of data for this work. Each cow, given that it was an intensive milk production system, had an identification number and other information such as: date and time of calving, time of manual processing of the placenta, appearance of oestrus, time of insemination, attempt of insemination and date of establishment of calving.

After calving, if the placenta itself does not separate and fall out of the reproductive tract within 12 to 24 hours, prostglandin PGF2α is administered, but never before 24 hours after calving. Based on the data collected for the reproductive indices of the cows, three groups were formed. The first group (X_1) consisted of 34 cows, with the partus normally flowing. The second group (X_2) consisted of 20 cows whose placenta was manually removed within 30 hours after the partus, and the third group (X_3) consisted of 14 cows whose placenta was also removed manually after 30 hours after the partus. The reproductive parameters that were monitored were the insemination index and the success of the insemination attempt. For the determined reproductive parameters, the basic indicators of descriptive statistics were calculated: arithmetic mean ($\overline{X}$), standard deviation (S), standard error of arithmetic mean ($S\overline{x}$), coefficient of variation (V), and minimum and maximum values. Homogeneity of variance in reproductive parameters between groups of cows was tested by the F - test, and the difference between the means was tested by the t – test.

RESULTS AND DISCUSSION

Post-partum insemination occurs at moments that are very stressful for the cow. Thus it can be said that the insemination index is burdened with high milk production, as well as the inability to consume large amounts of dry matter that would satisfy the cows' need for high milk production. Then, establishing a hormonal reaction that triggers the estrous cycle with pronounced libido are all phenomena that trigger violent reactions. Table 1 presents statistics for the post-calving insemination index in this paper.

Table 1. Insemination index for groups of monitored cows

Cow group	n	$\overline{X}$	**S**	**S** $\bar{x}$	**V**	Min	Max
X_1	34	1.29	0.46	0.08	35.74%	1	2
X_2	20	2.10	1.52	0.34	72.30%	1	7
X_3	11	4.86	3.37	0.90	69.40%	1	12

In the group of cows with normal partus, the optimal post-partum insemination index was determined. The increase in the index increased with the extension of the lag period of the placenta, meaning that the cows with the longest lagging of placenta with the hand-treated placenta had the highest insemination index. It is important to emphasize that in the monitored group with the longest lagging behind, 21.4% of cows failed to conceive even after multiple attempts of insemination with a service period of up to one year. The main statistical indicators of the artificial insemination index in the paper are shown in Table 1. The average value in the control group X_1 with 34 heads is 1.29 with a deviation of 0.46 and a standard error of 0.08. In the group of cows X_2 with a lag period of placenta for up to 30 hours the index of artificial insemination is 2.1 with a deviation of 1.52 and the standard error of 2.1, while in the group of cows X_3 with a lag of more than 30 hours the value of the insemination index is 4.86 with a deviation of 3.37 and a standard error of 0.9.

The standard error is less than the calculated deviation in the hypothesis proving procedure, indicating that in the normal-calf cow group X_1, the insemination index with a smaller range in insemination attempts, as opposed to the cows with lagging placenta X_2 and X_3 where the insemination index is higher. Based on the calculated variance with the results in Table 1, given their large non-uniformity, it can be concluded that there are significant differences in the insemination index in all three groups of cows under study.

The insemination index of red Holstein in the trial after the first calving was 3.71, the second 2.85 and after the third calving 3.17; while in Norwegian red bovine in the same experiment after the first calving, the value for the insemination index was 3.56, after the second 1.88 and the third 1.25 (Vazic, 2007).

Table 2 shows the variance analysis data for the calculated F test of the reproductive trait, post-partum insemination index for the monitored cow groups.

Table 2. Results of variance analysis for the calculated F-test insemination index

Group	$\overline{X}$	$X_3 - X_1$	$X_3 - X_2$	$X_2 - X_1$	F calculated	F tab.	
X_1	1.29	3.57	2.76	0.81	20.73**	0.05	0.01
X_2	2.10					3.14	4.95
X_3	4.86						

The calculated value of the F - test indicates that the difference in arithmetic means of the insemination index between groups of cows is statistically highly significant. The calculated F test value of 20.73 for a probability of 0.05 and 0.01 indicates that this is a statistically

highly significant difference from the tabulated value indicating that cows that did not have a lagging of placenta had a more favorable index of artificial insemination than cows with a placenta lagging behind.

The index of artificial insemination in the experimental group of cows with retained placenta and with prostaglandin administration was 1.87, while in the control group of cows with retained placenta without administration of prostaglandin, the index of artificial insemination was 2.08 (Krizanec et al., 2003).

The results of the t - test of differences of arithmetic means for the insemination index are shown in Table 3.

Table 3. Results of t-test, index of insemination per partus between groups of cows

	X_1	X_2	X_1	X_3	X_2	X_3
Average $\bar{X}$	1.29	2.10	1.29	4.86	2.10	4.86
$T_{cal.}$	**2.31***		**3.94****		**2.86***	
$T_{tab.}$	2.08	2.83	2.16	3.01	2.11	2.90
	T 0.05	T 0.01	T 0.05	T 0.01	T 0.05	T 0.01

For the post-calf insemination index, the t-test established a statistically significant difference between the average values between the studied groups. The most unfavorable established reproductive parameter was found in the group of cows with normal partus and on time ejected placenta compared to the group of cows with retained placenta after 30 hours from partus. Between the groups of cows with normal calving X_1 and group with processed placenta for up to 30 hours X_2 there is a statistical difference between arithmetic means in the index of artificial insemination as well as between groups of cows with lagging placenta behind. From this it can be concluded that it has been proven that the insemination index in cows in group X_1 that had a lagging placenta of up to 30 hours would be significantly higher than in cows in group X_1 that had normal calving. Also, in the group of cows X_3, with a lagging placenta over 30 hours, the index of artificial insemination is statistically significantly higher than the control group of cows.

The success of insemination of cows is directly reflected in the results of the index of artificial insemination, while the percentage representation of the same is closer to the approach of displaying the effect of conception. The success of insemination was shown by the percentage of successfully inseminated cows in the study groups relative to the number of attempts.

The success rate of insemination for the control group of cows X1, which had normal partus and puerperium, indicates that from the first artificial insemination, the success rate of conception of cows was expressed with high percentage of 79.41%. All other cows in this group remained pregnant from the second artificial insemination (20.59%). It can be noted for this group of cows the great success of the insemination from the first attempt and the fact that all the cows successfully conceived from the first two attempts.

The conceptual success status of cows in the studied groups is different, with a clear difference from the control group. In the experimental group X2, with manual treatment of the placenta up to 30 hours, from the first attempt at artificial insemination, 45% of cows were successfully conceptualized, from the second 30%, from the third 10% and from the fourth and more 15% of cows. The insemination interval in this experimental group ranges from 1 to 7 to conception throughout the group. Although a large interval in inseminations, success is still 100% for the whole group of cows.

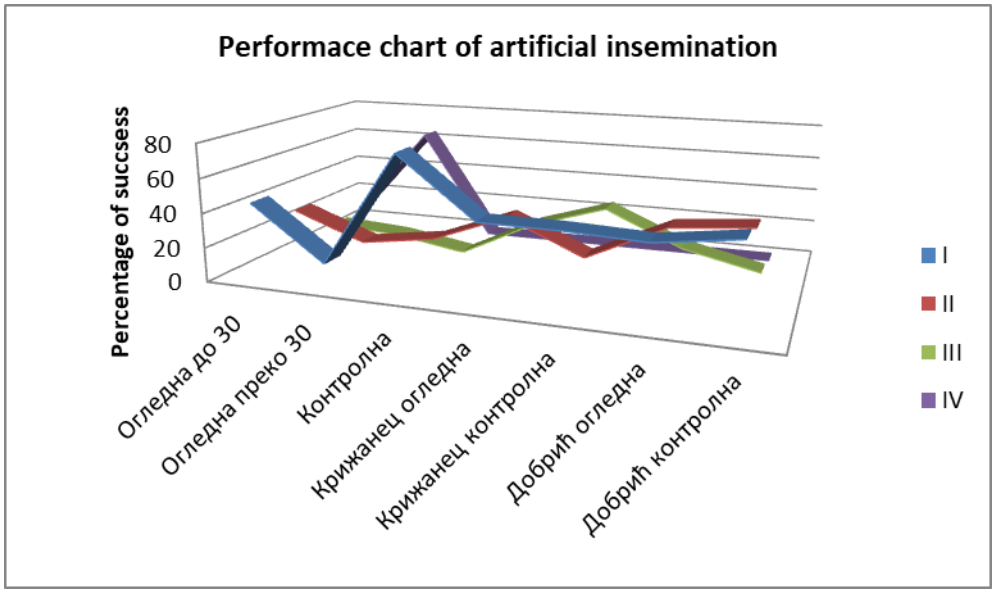

Figure 1. Graphic presentation of insemination performance compared with previous authors

In the studied group of cows X_3, with a placenta of 30 to 48 hours, and numbering 14 cows, the success of artificial insemination was as follows: from the first insemination conceptualized 14.3% of cows, from the second 7.15% of cows, from the third 7. 15%, while from the fourth and more inseminations, 50%. In this group of cows, in addition to the significantly longer duration of the cycle for establishing cyclical oestrus, the longer duration of the service period, it was observed that 3 cows failed to conceive (21.4%). Successful

insemination intervals in this group range from 1 to 12. Cows that did not remain pregnant were extracted from further milk production because they were burden the group. By this review of the success of insemination has in another practical way issued the problem of lagging of the

As reported, Dobranic et al. (2006), the success of conception of cows with lagging of placenta as an experimental group and of normally calved cows as a control group, in the first insemination amounts to 44% and 50% respectively, in the second insemination is 40% and 44%, respectively, in the third insemination is 3% and 6% respectively. There were no more than three inseminations in the control group, and in the experimental group this percentage for the third and each subsequent insemination was 13%. The index of artificial insemination in the experimental group was 1.90 and the control was 1.56.

The success rate of insemination on the first attempt in the experimental group of cows was 46.06%, and in control was 45.76%. In the second attempt, this value in the experimental group was 37.5%, in the control group 18.64%, and for the third and every subsequent successful insemination in the experimental group was 21.88% and in the control group was 35.65%, (Krizanec et al., 2003). Holt et al. (1989) report on index of artificial insemination in cows with light calving without lagging of placenta and those with lagging of placenta. In the first group the index of artificial insemination was 1.6 and in the second were 2.5.

CONCLUSIONS

Cows that produce large amounts of milk have impaired reproductive capacity, which is reflected especially in their overall production. A higher insemination index and poorer insemination success cause fewer calving and fewer lactations, and therefore less life-long milk and meat production. Among the factors that impair the reproductive capacity of cows is the lag of the placenta after partus. Cows in which the placenta was ejected in the predicted time period, without manual processing, have a smaller insemination index and more successful insemination than groups of cows with lagging placenta. Likewise, a statistically significant difference was found for the insemination index and the success rate of insemination between the two groups of cows with lagging litter. The lag of the placenta in cows adversely affects reproduction and overall production. When the placenta is lagging, it is necessary to begin processing it as soon as possible, as any delay leads to pathological changes that adversely affect the reproductive tract, and thus impair the reproductive condition of the cow.

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