

Utilization of biotechnologies in reproduction of high milk efficiency cows

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Introduction

The evaluation of the results of the dairy cattle reproduction in the last periods in the number of countries states the continuous reducing of the pregnancy and the prolongation of such indicators like insemination interval or service period. Similar trend stands on record also in the Czech Republic in the results of fertility in the monitoring of dairy cattle efficiency.

The breeding efficiency is influenced by the level of management, physiology, nutrition, breeding environment quality and health of the animals, which can dramatically change the results of the reproduction.

The objective of the care of reproduction is to have all breeding cows in active phase of reproduction, to minimize the losses in all periods of reproduction cycle and to exploit to the limit the natural reproductive potential along with the costs reduction for the treatment of health disturbances, almost complete heat synchronization, so how it is often used in our herds or the exploitation of the assisted reproduction method.

There are a number of tools for detection of heat. The test of the crystallization (arborisation) of cervical mucus is a method, which we can use as tool for detection of heat even if in the meantime in practice it did not find wider application. The crystallization can be observed under microscope 3-4 days before start of the heat, more intensively at the time of heat. In dependence to the phase of heat, it is possible to observe various patterns of the mucus crystallization. The test of the penetration activity of sperm is suitable method for the evaluation of the interaction of sperm and of the environment of cervical mucus.

The breeders are using for improvement of the fertility results the hormonal programs. Ovsynch is a method, which is used for dairy herds without the necessity of the heat detection. This method of synchronization uses 2 syringe applications GnRH and 1 injection PGF2 α , used after 1st application of GnRH. The insemination takes place within 0-24 (optimally 16) hours after 2nd application of GnRH.

Methods

The results of reproduction in herd of high efficiency Holstein cows were evaluated. Methods of heat detection, reproduction characteristic (conception rate, interval period, and service period), and method of heat synchronization in relation of health state and milk efficiency (milk yield – average 33,67 kg of milk per day, number of lactation- average 2,31) of cows were detected. The cows with reproduction disorders (average of interval period 115,13 days, service period 189 days, number of insemination 2,97) were treated by OV-SYNCH method to heat synchronization and ovular dysfunction

therapy in regular 14- the day's intervals. Samples of cervical mucus for laboratory testing (arborisation and durability test) were sampled in this group of cows.

The cervical mucus was withdrawn by a sterile pipette at the time of the cows' insemination. The arborisation tests (crystallization) of the cervical mucus for assessment of insemination time suitability and the test of sperm survival in cervical mucus for assessment of pregnancy potency were realized.

Results and discussion

The average fertility rates after all insemination were 40.92% at day milk yield 33.67 kg and 3.21% protein content. Milk efficiency per 100 days of lactation 3575.5 kg of milk and 112.2 kg of protein was found out. Cumulative reproduction failure frequency was 44.76-47.36% of cows in monitored herd. Conception rate of OV-SYNCH treated cows was 46.3% after first insemination, 45.95% after all inseminations. Improvement of conception rate is 2.97-5.8% in comparison with the rest of cows without synchronization treatment. This system is used more efficiently at cows, at which the synchronization can come up to 90% of heats (PURSLEY et al., 1998).

Trend of markedly higher level of conception in first to 3rd lactations, especially in relation to 4th lactation was detected ($P \leq 0.05$).

The conception rate in relation of sperms motility in cervical mucus durability test was evaluated. ZAAIJER D et al. (1993) tested the hypothesis that the composition of cervical mucus can be used as an indicator of reproductive efficiency in the cow; and their results suggest that the composition of cervical mucus may be a useful indication of potential fertility in cattle.

Higher percentage of pregnancy was detected in case of higher motility and longer survival of sperms in cervical mucus durability test. Motility of sperms was at average 21.74%, respectively 12.92% and 7.79% in process of 30, resp.60 and 90 minutes durability test. Conception rate was only 1.95% in case of zero motility of sperms after 30 minutes durability test.

Stable and the best results of sperms motility in process of durability (30, 60, 90 minutes) test compared with cervical mucus arborisation in cases of ferny crystallization (typical of second half of heat period – the best stage for insemination) were detected. TSILIGIANI et al. (2001) found out significantly higher sperm penetration in cervical mucus of the group of cows in normal heat in comparison with the synchronized heat. The activity of most enzymes in the cervical mucus of cows was significantly different between the spontaneous and the induced estrus groups (TSILIGIANI et al., 2003; GANDOTRA et al., 2006).

Conclusion

Using of OV-SYNCH for timing of AI is documented of results of improvement conception rates in problem cows.

Presumption of better conception results in cows with higher activity and longevity of sperm in their heat mucus was confirmed.

Table 1 : Conception rate comparison of two groups of cows (problem cows = OVSYNCH and the rest of herd =spontaneous heat)

	inseminations	spontaneous heat			OVSYNCH		
		n pregnant cows	n inseminations	% conception rate	n pregnant cows	n inseminations	% conception rate
In total	First	26	60	43.33	25	54	46.30
	All	55	137	40.15	51	111	45.95

Table 2 : Conception rate results of cows in dependence to number of lactation, number of inseminations and health disorders

	Lactation number			Insemination number			health*		
	n	$\bar{x}$	s _x	n	$\bar{x}$	s _x	n	$\bar{x}$	s _x
1	59	42.37	6.40	65	43.08	6.10	118	44.07	4.52
2	34	41.17	8.43	39	41.03	7.88	36	30.56	8.19
3	35	48.57	8.30	25	24.00	9.84			
4	13	15.38	13.63	14	57.14	13.45			
5	10	40.00	15.53	6	66.67	20.10			
P≤0,05	1-4, 3-4			3-4, 3-5					
* 1=ill, 2=health									

Table 3 : Conception rate results of cows in dependence to sperms activity (motility) in cervical mucus samples and test duration

% active sperms	test 30 minutes			test 60 minutes			test 90 minutes		
	n	$\bar{x}$	s_x	n	$\bar{x}$	s_x	n	$\bar{x}$	s_x
0	15	1.95	22.89	34	47.06	8.40	84	40.00	5.89
1	13	4.26	21.57	30	33.33	8.94	30	45.83	10.06
10	13	51.27	18.18	28	42.86	9.26	23	66.67	12.72
20	27	49.43	17.04	19	26.32	11.24	23	27.77	11.62
30	47	65.21	14.79	26	57.69	9.60	15	50.00	13.17
40	17	73.61	17.07	6	66.67	19.99	6	20.00	22.04
P≤0,05	1-3,4,6, 2-4,6,4-5			2-5,4-5,6			1-3, 3-4,6		
P≤0,01	1-5, 2-3,5								

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