The Evolution of Holstein Breed Cows' Health Udder of Different Provenance According to Somatic Cell Count in Milk

Pero MIJIĆ[1]
Ivan KNEŽEVIĆ[1]
Dražen GRGURIĆ[2]
Hrvoje GUTZMIRTL[2]
Damir RIMAC[1]
Mirjana BABAN[1]

SUMMARY

A high quality milk production requires a constant health udder observation. The somatic cell count is used as a reliable and internationally recognized method. The former research showed a jeopardized udder health condition of high productive milk cows. An insufficient milk production in the last few years caused Croatia to import a large number of Holstein cows. We wanted to compare a possible distinction of health udder in imported and domestic cows.

Research was conducted on 257 Holstein cows out of which 155 were domestic and 102 imported. During the research period, domestic cows had a lower medium rate for LSCC (3,77) than the imported cows (3,94). Better results in domestic cows were also found in percentage share to 400.000 SCC/ml of milk (72,90% in domestic cows and 65,69% in imported cows). Results were compared according to lactations, lactation stages and farms, but statistically significant differences were not found. Health udder as the most important factor of quality milk production should be included into cattle-breeding program of Croatia as soon as possible. According to research results, domestic cows have good predispositions for maintaining a healthy udder and quality milk.

KEY WORDS

somatic cell count, health udder, holstein cow

[1] Faculty of Agriculture
Trg sv. Trojstva 3, 31000 Osijek, Croatia
e-mail: pmijic@pfos.hr

[2] Center for Livestock Production Improvement
Vinkovačka c., 31000 Osijek, Croatia
e-mail: drazen.grguric@os.tel.hr

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INTRODUCTION

One of basic priorities on milk farms is maintenance of cows health udder which is very often exposed to illness because of a demanding production and the influence of different environmental factors. Health udder disturbances, which appear as clinical or subclinical mastitis, cause financial loss to milk producers. Expenses refer to drugs, veterinarian's services, production decrease and a lower milk-selling price (Dodenhoff et al., 1999). The possibilities of treating the cow's udder from mastitis have been shrinking. Ecological rules and food quality regulations prescribed by the European Union demand healthy animals and their products through strict hygenical and sanitary norms. Pharmaceutical industry and veterinarian service will have to reduce drugs use on animals (Caput, 1996). Therefore breeding-selective possibilities should be used more to achieve healthy and resistant animals (Mijić et al., 2003).

Following parameters are significant for estimating the health udder of a single cow or the whole herd: the somatic cell count in milk, the percentage of sick animals in the herd and percentage of clinical and subclinical mastitis (Heeschen, 2002). The somatic cell count in milk is an internationally recognized parameter for evaluating the health condition of cow's udder. According to legal provision from 1995 in EU countries the fresh cow's milk must not contain more than 400.000 somatic cells/ml (Sarrazin and Scotti, 1995). Similar to the Regulations which are current in the EU countries, the Ministry of agriculture and forestry of Croatia adopted in 2000 the Regulations of fresh cow's milk quality (N. N. 102/2000) and an «Act of end price of fresh cow's milk» (N. N. 156/2002). According to the act, standard quality milk can maintain mostly 400.000 somatic cells/ml. Above this limit milk is classified into a lower class which is followed by a lower redemptory price. After the first milk analysis in the Central State Laboratory in Križevci (Kuterovac et al., 2002) and according to previous field research (Kalit and Lukač-Havranek, 1998; Mijić et al., 2001) a high percentage of cows with disturbed health udder was established, in other words the somatic cell count did not correspond to regulation demands.

In recent years Croatia has imported a larger number of Holstein cows from neighbouring countries which have a larger population of Holstein cows and where the problem of health udder has been taken into concern through breeding-selective methods for many years. The research aim was to establish the differences in health udder between imported and domestic cows of the Holstein-Friesian breed, because that the health udder according to the line of bull fathers in Croatia has not been researched.

MATERIAL AND METHODS

Research was conducted on two milk farms in East Croatia. The first farm had a free rang of cow keeping and the milking was performed at the milking parlour of 2x11 places capacity. The second farm had a tied way of cow keeping, and the milking was performed in cowsheds, on the place and into buckets. Before the measurements milking units were equalized to the same vacuum values (50 kPa), to a pulsation ratio of 70:30 and 60 pulsation/min. The way of feeding and ratio composition was unique on both farms, and the feeding influence was considered to be a fixed factor. During research microclimatic indicators were not observed. 257 Holstein-Friesian cows were included into research. 155 cows were domestic, that means their fathers come from the Centre for Livestock Production Improvement Osijek. Other 102 cows were imported, that means, their parents are from abroad. The cows were chosen from the first to the third lactation and in the early and middle lactation stage, from the 50th to the 180th day. This period, as the most useful prediction parameter (Mijić et al., 2003) was divided into three parts: the first from the 50th to 90th day, the second from the 91st to 135th day, and the third from 136th to 180th day. Only healthy cows with correct morphological appearances of udders and teats were analysed. Cows being treated for mastitis, or with udder edema, in estrus, sick, seriously injured, or exposed to a certain condition influencing their daily milk yields were not measured. For each cow one milk sample taking was done in the evening milking. The milk sample taking and measuring the drained quantity of milk was performed by LactoCorder, serial number 16842, SW-Version: 93004 (manufacturer WMB AG, CH-9436 Balgach).

The milk samples were analysed in the Central State Laboratory for milk quality control in Križevci whereby the chemical composition of milk and the somatic cell count were established. The chemical milk analysis was established by Bentley Analyser B2000, and the somatic cell count in milk by Bentley Somacount 500.

The health udder was established by the somatic cell count in drained milk. The somatic cell count (SCC), which was used for statistical analysis, was converted into logarithmic by means of a formula ($\log_2$(SCC/100.000)+3) and marked as LSCC (Ali and Shook, 1980). The mid values of LSCC domestic and imported genome were tested by a t-test and according to lactations, lactation stages and farms. All statistical operations were performed in statistical program SPSS 10.0 for Windows (2000).

RESULTS AND DISCUSSION

Table 1 shows the mid values of milk production, the milk fat and protein percentage in an average milking in the research time. The milk yield was higher by imported cows for 1,72 kg, while the milk fat percentage was higher by domestic cows for 0,13 %. The protein percentage was uniform. The result of higher milk productivity could be used in a better choice when buying imported cows.

The results of health udder per lactations observed through the somatic cell count in milk are shown in table 2. The mid value LSCC for all three lactations, as well as for the whole research period was higher in imported than domestic cows. From 102 imported and tested cows, 67 (65,69%) had in milk less than 400.000 SCC/ml, while 35 cows (34,31%) had SCC above the named limit. From 155 domestic cows, 113 (72,90%) had the SCC beyond the named limit, while 42 (27,10%) had the SCC above this limit. The consequence of this condition is most likely a bigger influence of environmental factors on imported cows than on domestic cows. The reason is that the cows' adjustment to productivity conditions has been slightly better by domestic genoms. This can be especially seen in both researched cow groups at first lactation (85,19 and 78,05% to 400.000 SCC) in distinction from the second and third lactation. However, the t-test results did not show statistically significant differences.

The established circumstances are not satisfactory in either researched cow group. Heeschen (2002) states that a herd should not have more than 10% cows sick of subclinical mastitis, for the treatment expenses significantly extend, and the milk production losses reduce for 30%. The EU countries faced problems with a high SCC in milk. According to Emanuelson and Funk's research (1991) in Sweden it was established that 26,7% of milk was mastitic, while in Germany (Roth et al., 1998) established in 45% of researched cows patogenic microorganisms in at least one quarter of udder.

Table 3 shows research results according to lactation stages. Health udder in imported cows was mostly jeopardized at first stage (LSCC=4,86) and in domestic cows at the second lactation stage (LSCC=4,09). The lowest LSCC for both researched groups was at the third lactation stage (LSCC=3,53 and 3,28) where the biggest milk sample with less than 400.000 SCC/ml (77,11 and 77,35%) percentage was established.

On the first farm, which had a free rang of cow keeping both domestic and imported, and milking in milking parlour, a similar percentage share was found in both researched groups, which had less

Table 1: Average values ($\bar{x}$), standard deviations (s) and minimal and maximal values of basic productive results per milking for domestic and imported cows from the 50th to 180th lactation day

Trait	Home (*n= 155)			Import (n= 102)		
	$\bar{x}$	s	min-max	$\bar{x}$	s	min-max
MY (kg)	9,59	3,39	5,00 – 16,04	11,31	3,12	5,00 – 18,78
MF (%)	3,85	0,76	2,28 – 5,27	3,72	0,81	2,00 – 5,63
MP (%)	3,48	0,40	2,64 – 4,78	3,49	0,45	2,17 – 4,79

*n= no. of cows (For table 1, 2, 3 and 4)

Table 2: Health udder indicators according to lactations for domestic and imported cows (from the 50th to 180th lactation day). Mid value ($\bar{x}$) and standard deviation (s).

Lactation	Trait	Home			Import		
		*n	$\bar{x}$	s	*n	$\bar{x}$	s
1	LSCC	54	2,94 n.s.	1,94	41	3,09 n.s.	2,01
	SCC/ml (1.000)	54	278	-	41	330	-
	≤ 400.000 SCC (%)	46	85,19	-	32	78,05	-
2	LSCC	46	3,88 n.s.	2,06	13	5,00 n.s.	2,09
	SCC/ml (1.000)	46	497	-	13	1.107	-
	≤ 400.000 SCC (%)	33	71,74	-	7	53,85	-
3	LSCC	55	4,48 n.s.	2,08	48	4,42 n.s.	2,53
	SCC/ml (1.000)	55	699	-	48	898	-
	≤ 400.000 SCC (%)	34	61,82	-	28	58,33	-
Total	LSCC	155	3,77 n.s.	2,12	102	3,94 n.s.	2,35
	SCC/ml (1.000)	155	492	-	102	657	-
	≤ 400.000 SCC (%)	113	72,90	-	67	65,69	-

For table 2, 3 and 4: **P ≤ 0,01; *P ≤ 0,05; n.s.=non significant

Table 3: Health udder indicators according to lactation stages for domestic and imported cows (from the 50th to 180th lactation day). Mid value ($\bar{x}$) and standard deviation (s).

Stage of lactation	Trait	Home			Import		
		*n	$\bar{x}$	s	*n	$\bar{x}$	s
1	LSCC	45	4,01 n.s.	2,23	28	4,86 n.s.	2,48
	SCC/ml (1.000)	45	585	-	28	997	-
	≤ 400.000 SCC (%)	32	71,11	-	14	50,00	-
2	LSCC	27	4,09 n.s.	2,46	21	4,41 n.s.	2,28
	SCC/ml (1.000)	27	773	-	21	924	-
	≤ 400.000 SCC (%)	17	62,96	-	12	57,14	-
3	LSCC	83	3,53 n.s.	1,92	53	3,28 n.s.	3,14
	SCC/ml (1.000)	83	351	-	53	371	-
	≤ 400.000 SCC (%)	64	77,11	-	41	77,35	-

Table 4: Health udder indicators according to farms for domestic and imported cows (from the 50th to 180th lactation day). Mid value ($\bar{x}$) and standard deviation (s).

Farm	Trait	Home			Import		
		*n	$\bar{x}$	s	*n	$\bar{x}$	s
1	LSCC	84	3,52 n.s.	1,97	40	3,16 n.s.	1,98
	SCC/ml (1.000)	84	386	-	40	338	-
	≤ 400.000 SCC (%)	64	76,19	-	31	77,50	-
2	LSCC	71	4,07 n.s.	2,26	62	4,45 n.s.	2,44
	SCC/ml (1.000)	71	618	-	62	863	-
	≤ 400.000 SCC (%)	49	69,01	-	36	58,06	-

than 400.000 SCC/ml in milk (76,19 and 77,50). A tied way of keeping and milking into cans, which was performed on the second farm, with both domestic and imported wows had a larger number of cows with disturbed health udder as consequence. The LSCC mid value in domestic cows was 4,07 and in imported 4,45. 49 domestic cows had less than 400.000 SCC/ml in milk (69,01%) and 36 imported (58,06%). Results indicate a higher resistance in domestic cows in regard to problems of health udder in named keeping condition, but the established differences were not statistically important.

CONCLUSION

Research done with two groups of Holstein-Friesian cows of different origin showed that the mid value for the LSCC was higher in imported than domestic cows. A higher SCC in imported cows indicated consequently a higher number of cows with disturbed health udder. Although differences of the LSCC mid values between domestic and imported cows according to lactations, lactation stages and farms were found, they were not statistically significant.

When Croatia becomes a part of the European market only milk producers with profitable production and high milk quality will be competitive. Our research showed that the health udder has been disturbed and should therefore be included into cattle breeding program. Healthier and more resistant animals to udder illnesses could be achieved in a selective way. At first only bull's mothers and fathers could be included but later positive variants could be implemented in the whole breed.

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