

STUDY ON THE CORRELATIONS BETWEEN THE NUMBER OF SOMATIC CELLS AND SOME MILK CONSTITUENTS RESULTED FROM COWS WITH CLINICAL MAMMITIS

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ABSTRACT – The investigations conducted on three groups of dairy cows with mammites, found at different stages of lactation, pointed out the correlations between the number of somatic cells from milk and some of its constituents, represented by the content in total dry matter, total proteins, lipids, lactose, casein and chlorides. Analysing the number of somatic cells and the milk constituents, we found the presence of the positive (+ 0.91 ; + 0.96) and significant correlations ($p \leq 0.05$) between the number of somatic cells and the evolution of the content in chlorides from milk in all the three groups of cows, which indicates that once with the increase in the number of somatic cells, the number of chlorides has proportionally increased, and the negative (-0.89; -0.96) and significant correlations ($p \leq 0.05$) between the number of somatic cells and the milk production, the content in lactose (-0.91; -0.96 and $p \leq 0.05$), casein (-0.87; -0.97 and $p \leq 0.05$), total proteins (-0.82; -0.93 and $p \leq 0.05$) and the fat content (-0.65; -0.91 and $p \leq 0.05$).

Key words: cow, mammitis, somatic cells, milk

REZUMAT - Cercetări privind corelațiile dintre numărul de celule somatice și unii constituenți ai laptelui provenit de la vacile cu mamită clinică. Cercetările, efectuate pe trei loturi de vaci cu mamită aflate în faze diferite ale lactației, au urmărit evidențierea unor corelații existente între numărul de celule somatice din lapte și unii constituenți ai acestuia, reprezentați de conținutul în substanță uscată totală, proteine totale, grăsimi, lactoză, cazeină și cloruri. Analizând valorile numărului celulelor somatice și ale unor constituenți ai laptelui,

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s-a constatat că există: corelații pozitive (+0,91; +0,96) și semnificative ($p \leq 0,05$) între numărul de celule somatice și evoluția conținutului de cloruri din lapte la toate cele trei loturi de vaci, ceea ce indică faptul că, odată cu creșterea numărului de celule somatice, crește proporțional și conținutul în cloruri; corelații negative (-0,89; -0,96) și semnificative ($p \leq 0,05$) între numărul de celule somatice și producția de lapte, conținutul de lactoză (-0,91; -0,96 și $p \leq 0,05$), conținutul de cazeină (-0,87; -0,97 și $p \leq 0,05$), conținutul de proteine totale (-0,82; -0,93 și $p \leq 0,05$) și conținutul de grăsime (-0,65; -0,91 și $p \leq 0,05$).

Cuvinte cheie: vacă, mamită, celule somatice, lapte

INTRODUCTION

Mammites are inflammations of the mammary gland with a significant importance in dairy cow breeding. The frequency of this disease is higher in dairy cows due to the favouring factors correlated to the exploitation mode. The economic losses are very high and the annual estimation indicated losses over 10 % of the milk production in the dairy cow sector. Most of the losses are the consequence of the reduction in the milk production, as well as in the modifications, which diminish the efficaciousness of processing, often leading to the interdiction of consumption (Constantin, 2003; Jones and Bailey, 1998; Popa and Vlăgioiu, 1996; Roșca et al, 2002; Santos et al., 2001; Wilmot et al., 1990; Zecconi et al., 1994).

The determination of the number of somatic cells from milk is the most important parameter used today for monitoring directly the health condition of the mammary gland and, indirectly, the milk quality. An increased value of somatic cells over 300,000 / ml is abnormal and indicates the evolution of an inflammatory process at the mammary gland (Ghergariu et al., 2000; Popa and Vlăgioiu, 1996; Roșca et al., 2002; Santos et al., 2001; Taylor, 2004; Wallace et al., 2001; Wattiaux, 2001).

MATERIALS AND METHODS

The investigations concerning the modifications of milk, due to the inflammation of the mammary gland were carried out on 15 dairy cows, which have shown clinical symptoms of mammitis. The inflammation was localized in one or more of the four compartments of the mammary gland.

The studied cows were classified in three groups; each of them was made up of five animals, depending on the phase of lactation and on the moment when the inflammation was detected: Group 1 - cows with mammites, found in the first 2 months post-parturition; Group 2 – cows with mammites, found in 3-5 months of lactation and Group 3 – cows with mammites, found in 5-7 months of lactation.

The following parameters were determined: number of somatic cells (SomaScope MKII™), daily milk production, total dry matter, total proteins, fat, lactose, casein and chlorides.

CORRELATIONS BETWEEN THE NUMBER OF SOMATIC CELLS AND MILK CONSTITUENTS

The samples were collected only from the compartments affected by inflammation, and the obtained results were processed and interpreted statistically.

RESULTS AND DISCUSSION

Our studies have shown that **the number of somatic cells** in the milk sampled from the groups of animals with clinical mastitis presented constantly an increased value, comprised between 5.84 and 6.41 mil. somatic cells / ml, with a mean value of 6.12 ± 0.17 (mil. NSC (Number of somatic cells) / ml \pm Standard Deviation) in the third group (*Table 1*). Analysing the results recorded in the three groups of cows with mastitis, the mean low values of NSC/ ml (5.98 ± 0.11) were found in Group 1, represented by cows with detected mastitis found in the first 2 months post-parturition. On the other hand, the highest values (6.27 ± 0.12) were detected in Group 2, represented by cows with mastitis, diagnosed between the 3rd and the 5th month of lactation (*Table 1*). The number of somatic cells is generally positively correlated with the intensity of the inflammatory process, but for the interpretation of the results, it is essential to take into consideration the normal variation of the parameters during the lactation period, parameters that may affect the obtained results.

Table 1 - Variations of the parameters determined for the identification of milk from cows with mastitis

Parameter	Group 1			Group 2			Group 3		
	Min. value	Max. value	Mean	Min. value	Max. value	Mean	Min. value	Max. value	Mean
NSC (mil/ml)	5.86	6.13	5.98	6.10	6.41	6.27	5.89	6.32	6.12
Milk production (l) (Daily)	6.8	9.8	7.96	8.9	11.2	9.9	5.5	7.4	6.42
TDM (%)	11.68	13.15	12.29	10.89	12.42	11.79	12.34	13.5	12.90
Total proteins (%)	3.05	3.29	3.16	2.94	3.46	3.25	3.31	3.59	3.48
Fat (%)	2.6	4.1	3.38	2.5	3.2	2.84	2.9	3.6	3.22
Lactose (%)	3.30	3.67	3.45	3.42	3.89	3.63	2.59	3.30	2.92
Casein (%)	2.34	2.62	2.51	2.03	2.43	2.19	2.32	2.51	2.44
Chlorides (g Cl%)	0.168	0.176	0.172	0.127	0.151	0.143	0.132	0.161	0.145

As concerns **the daily milk production** in all the three studied groups, we found that the values had great variations, situated between 5.5 and 11.2 litres, representing a diminution of 25 %- 40 %, compared with the normal values (*Table 1*).

The values of **the total dry matter (TDM)** were comprised between 10.89% and 13.50%, the highest values being obtained in Group 3 (12.90%). For a correct interpretation of these values, it is necessary to correlate them with the variations of the milk production and the variations of milk constituents, knowing that the highest values of TDM are recorded at the beginning and end of lactation.

The total proteins from milk showed values comprised between 2.94% and 3.59%, with a mean value of 3.30%; the highest value was recorded in Group 3 (3.48%) and the lowest one, in Group 1 (3.16%). The values of the total protein in the tested samples did not differ very much from the normal values of milk. For a better interpretation, it is necessary to compare the values of the total proteins with the values of casein.

The fat content of the tested samples varied between 2.5% and 4.1%. The variation of the fat content from milk is not an important indicator for the health condition of the mammary gland, because the normal variations are found within very wide limits and the variations recorded when the gland is affected may seem normal.

In the tested samples, **the lactose content** has varied between 2.59% and 3.89%, the mean values being lower comparatively with the normal value of milk. The mean lowest values were recorded in Group 3 (2.92%), where the reduction of the lactose synthesis coexists with the normal decrease of the lactose from milk, in the period of lactation.

Casein, the most important protein of the cow milk, presents a mean value of 2.8% in the normal milk and, generally, the variations are not so visible. As concerns the tested samples, the casein content may vary between 2.03% and 2.62%, with a mean value of 2.38%. If these values are reported to the mean casein values of the normal milk, decreases may be found in all the groups of cows (*Table 1*).

The values of **the chlorides** from the tested samples have varied between 0.127 and 0.176 (g Cl- %), the highest values being recorded in Group 1 (0.172 g Cl- %), in which the alteration of the synthesis mechanism of mammary gland coexists with the increased concentration of chlorides from milk, characteristic to the beginning of lactation (*Table 1*).

Analysing the existing correlations between the studied parameters, we found the existence of:

- positive (+0.91; +0.96) and significant correlations ($p \leq 0.05$) between the number of somatic cells and the evolution of the chloride content from milk in all the three groups, indicating that once with the increase in the number of somatic cells, the chloride content increases proportionally.
- negative (-0.89; -0.96) and significant correlations ($p \leq 0.05$) between the number of somatic cells and the milk production, on the one hand, and, on the other hand, the content in lactose (-0.91; -0.96 and

CORRELATIONS BETWEEN THE NUMBER OF SOMATIC CELLS AND MILK CONSTITUENTS

$p \leq 0.05$) and casein (-0.87; -0.97 and $p \leq 0.05$), the total protein content (0.82; -0.93 and $p \leq 0.05$) and the fat content (-0.65; -0.91 and $p \leq 0.05$) (Table 2). In all the three groups with mastitis, we found significant differences for all the studied correlations.

Table 2 - Correlations between NSC and some of the constituents from the milk of cows with mastitis

	Numbers of somatic cells (NSC)					
	Group 1		Group 2		Group 3	
	CC*	p*	CC*	p*	CC*	p*
Milk production	- 0.96	< 0.05	- 0.89	< 0.05	- 0.96	< 0.05
TDM	- 0.73	> 0.05	- 0.86	> 0.05	- 0.84	> 0.05
Total proteins	- 0.82	> 0.05	- 0.93	< 0.05	- 0.82	> 0.05
Fat	- 0.65	> 0.05	- 0.87	> 0.05	- 0.91	< 0.05
Lactose	- 0.95	< 0.05	- 0.91	< 0.05	- 0.96	< 0.05
Casein	- 0.92	< 0.05	- 0.97	< 0.05	- 0.87	> 0.05
Chlorides	0.91	< 0.05	0.93	< 0.05	0.96	< 0.05

CC = correlation coefficient

p* = significance degree

CONCLUSIONS

The number of somatic cells from the milk resulting from the three groups of cows with clinical mastitis showed values between 5.48 and 6.41 million somatic cells / ml, values which are characteristic to the milk of cows with mastitis.

The daily milk production decreased by 25% until 40%, comparatively with the normal values and was negatively (-0.89;-0.96) and significantly ($p \leq 0.05$) correlated.

Casein recorded lower values comparatively to the values of the normal milk, showing values between 2.03% and 2.62%, which have been negatively and significantly ($p \leq 0.05$) correlated to NSC.

The lactose content varied between 2.59% and 3.89%, being negatively and significantly ($p \leq 0.05$) correlated with the content in chlorides and NSC.

The values of chlorides from the tested samples varied between 0.127 and 0.176 (g Cl- %) and were positively and significantly correlated with the number of somatic cells from milk.

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