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Factors Determining Somatic Cell Content in Farm Livestock Milk

Czynniki warunkujące zawartość komórek somatycznych w mleku zwierząt gospodarskich

The increase of somatic cell content in secretion is a general criterion of secretional distortions of milky gland arising against an infectious or non-infectious background (2, 3, 4, 7, 9, 10). Breeding treatments tending to increase the efficiency contribute to growing udder diseases, which is reflected as decrease of milky gland immunity (2, 5, 9, 10). When pathogenic microorganisms or injuries overcome the udder immune barrier (teat canal, epithelium of milk sinus, milky canals and gland tissue acinus), immune cells of connective tissue become active and penetrate into milk. At the same time, cardiovascular and lymphatic system of milky gland as well as general immune system of the organism begins to cooperate making neutrophilic granulocytes along with lymphocytes B and T active. Therefore, the number of somatic cells increases. They are leukocytes, granulocytes, lymphocytes, macrophages and dead cells and products of their decomposition (1, 2, 7). Somatic cells become of increasing importance in relation to immune mechanisms, but their count in milk is the quality criterion and gives fast information upon the health state of milky gland before disease symptoms occur (2, 4, 5, 6, 9, 10).

The aim of the studies was to estimate the factors determining the somatic cell content in milk from different farm livestock.

MATERIAL AND METHODS

Studies upon the somatic cell count in cows' milk were carried out for 14 years, sheep's milk – 8 years, goats' milk – 5 years and Arab mares' milk – 3 years. Population of 300 cows, 600 sheep, 100 goats and 30 mares during full lactation period was observed. Animals were under continuous veterinary control.

Milky gland health was assessed using accepted methods in order to exclude or confirm the pathological states of udders. Moreover, age, lactation phase, Californian test results and etiological factor *mastitis subclinica* were taken into account. Cytological and bacteriological tests were performed according to Polish Norm (8).

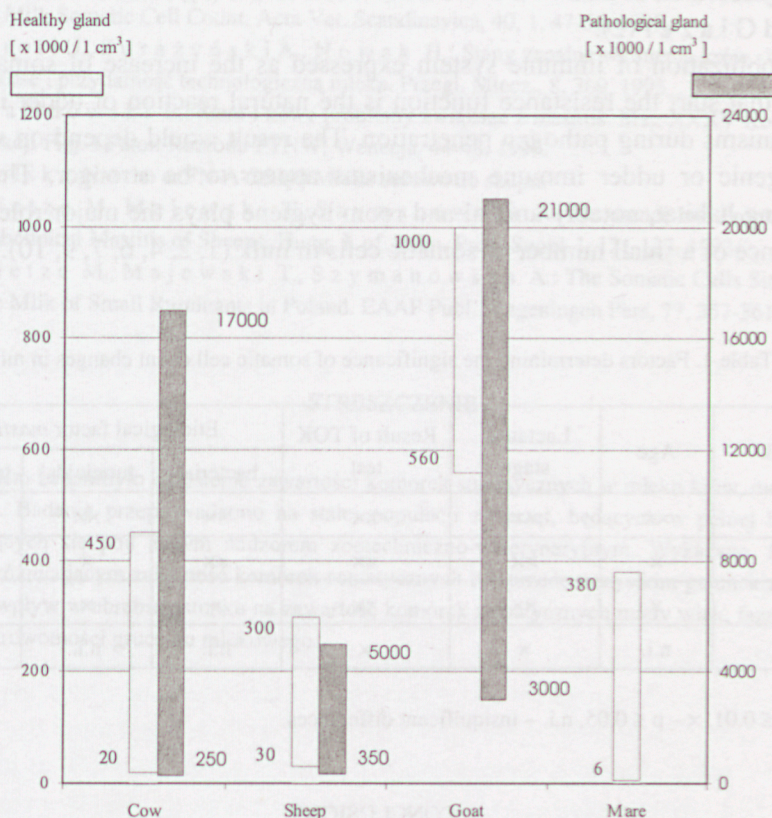
Somatic cell count was estimated using Prescott-Breed's method at the initial stage of studies, then Fossomatic device was applied. The results were statistically analysed and the difference significance was checked with Duncan test.

RESULTS AND DISCUSSION

The quality of raw milk subjected to processing depends on many factors. Besides the breed and individual factors as well as storage conditions, the general health state, namely milky gland health, is one of the most important (1, 2, 7, 9). Udder infection states frequently occurring make the technological usefulness of milk worse due to the changes of its physicochemical and cytological properties. They can become the epidemiological and epizootic threat, which increases production and processing inputs (2, 3, 4, 9, 10).

According to Glazer (2), Haman (3) and other authors (4, 6, 10), somatic cell count in healthy udder milk oscillates within a wide range, and physiological limits are mostly determined by the species. In Poland, quality norms refer to somatic cell content in raw milk from cows and pasteurized milk from goats. Age and the sequence and phase of lactation, milky gland healthiness, and in case of *mastitis subclinica*, the type of etiological factor, set the physiological limits of somatic cell count within a given species. *Mastitis subclinica* states on bacterial, fungal and injury backgrounds were taken into account in the present paper.

According to Malinowski (7), Glazer (2), Kleinschroth and Rabold (4), as well as 14-year authors' own observations, somatic cell count in cow's and sheep's healthy udder ranges widely and can amount to from 20 000 to 300 000 in 1 cm^3 (Fig 1). For goats, the count is much higher amounting to about 1 million, on average. Mares' milk contains the fewest cell elements (from 6 000 to 380 000 in 1 cm^3) at mean value about 100 000 in 1 cm^3 of milk. No pathological state of milky gland was found for mares during observations.



Ryc. 1. Komórki somatyczne w mleku różnych gatunków zwierząt gospodarskich
Somatic cell count in milk from different species of farm livestock

Penetration of microorganisms into the udder or injuries of gland tissue and teats due to improper milking contributes to the increase of somatic cell content in a different way, making it up to dozens of millions. Physiological number of somatic cells in milk significantly changes. It follows from the authors' own studies that cow and goat age was the factor determining the difference significance ($P \leq 0.05$); that of sheep and mare had a slight effect (Table 1). Lactation phase as well as milky gland healthiness assessment revealed a highly significant influence in all the species studied. The role of pathogenic factor had a highly significant effect in bacterial and fungal inflammation in cows and goats ($P \leq 0.01$). Little significant differences ($P \leq 0.05$) were recorded referring to somatic cells content in mares. During the authors' studies routine TOK test gave positive result despite a clinically healthy udder. Such a fact was confir-

med by research of Malinowski (7), Haman (3), Koldeweij et al. (5) and Glazer (2).

Mobilization of immune system expressed as the increase of somatic cell count that start the resistance function is the natural reaction of udder immune mechanisms during pathogen penetration. The result would depend on whether pathogenic or udder immune mechanisms appear to be stronger. Therefore, breeding habitat, notably animal and room hygiene plays the major role in maintenance of a small number of somatic cells in milk (1, 2, 4, 6, 7, 9, 10).

Table 1. Factors determining the significance of somatic cell count changes in milk

Milk	Age	Lactation stage	Result of TOK test	Etiological factor <i>mastitis</i>		
				bacterial	fungicidal	traumatic
Cows	xx	xx	xx	xx	xx	xx
Sheep	x	xx	xx	xx	x	x
Goats	x	xx	xx	x	x	xx
Mares	n.i.	x	x	n.i.	n.i.	n.i.

xx – $p \leq 0.01$, x – $p \leq 0.05$, n.i. – insignificant differences.

CONCLUSIONS

1. Somatic cell count is differentiated by farm livestock species. Milk from healthy udder of goat, then cow and sheep contains the highest number of the elements; mare milk displays their lowest level.

2. Statistically significant effect of age, lactation phase and milky gland healthiness along with etiological factor *mastitis subclinica* on somatic cell content in milk from cow, sheep, goat and mare was found.

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STRESZCZENIE

Celem badań było określenie zawartości komórek somatycznych w mleku krów, owiec, kóz i kłaczy. Badania przeprowadzono na stałej populacji zwierząt, będących w pełnej laktacji i znajdujących się pod stałym nadzorem zootechniczno-weterynaryjnym. Wykazano, że czynnikiem różnicującym zawartość komórek somatycznych był przede wszystkim gatunek zwierząt. Istotny wpływ w obrębie gatunku na zawartość komórek somatycznych miały wiek, faza laktacji i stan zdrowotności gruczołu mlekowego.

MATERIAL I METODY