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EFFECT OF SOMATIC CELL COUNT ON PROTEINS IN COW'S MILK

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Abstract

Milk composition is an important factor of the dairy industry and milk proteins are the most valuable component for the profitability. The aim of this work was to investigate the impact of somatic cell count (SCC) on the physicochemical properties in raw milk, especially on the milk proteins (casein and whey proteins). Milk was collected and analyzed for fat, lactose, dry matter, freezing point, pH, density, whey proteins, casein, and SCC. Milk samples were divided into three groups according to the value of SCC. Results indicated that increased value of SCC leads to a reduction of the casein in milk. On the other hand, the concentration of whey proteins increased. Also, elevated SCC were also related to lowered milk quality.

Keywords: somatic cell count (SCC), proteins, casein, whey proteins

Introduction

Milk with high somatic cell count undergoes several chemical changes. In general, more intense changes occur in the proteins. High somatic cell counting significantly affects protein fractions. Normal bovine milk contains about 3.5% protein. Milk proteins are divided into two classes and are no more thought to be a homogeneous protein (P. F. Fox et al., 2015). Caseins constitute about 80% of total proteins and the remaining 20% are whey proteins. Caseins are essential for the structure, texture, taste, and healthiness of milk products.

Total protein in milk with high SCC can remain unchanged or undergo small changes, because the content of casein decrease is accompanied by an increase in whey proteins, resulting in a negligible change in total milk protein (Ramos et al.2015).

Materials and methods

Raw milk samples were collected from cows that were randomly selected and analyzed for fat, lactose, dry matter, freezing point, pH, density, proteins by Milk analyzer Lactoscan MCC. Additionally, samples were analyzed for casein and whey proteins by Kjeldahl method. The somatic cells were determined by Bentley Somacount CC 150. Milk samples were divided into three groups according to the value of SCC (Group 1 200×10^3 SCC/ml; Group 2 201-400 $\times 10^3$ SCC/ml; Group 3 $> 1000 \times 10^3$ SCC/ml).

Results and discussion

The chemical composition of milk with different somatic cell counts is shown in Table 1. Milk with elevated high SCC has been associated with changes in milk protein, milk fat, and lactose. Mastitis or elevated SCC is associated with a decrease in lactose, -lactalbumin, and fat in milk because of reduced synthetic activity in the mammary tissue (Harmon, R. J. 1994). Total solids, SNF and fat content slightly increased, which correlate with the results from Mohammed N. A. and Ajay K. D. (2018).

According to the results, protein had a slightly increment with higher concentrations of SCC where the concentration is changing from 3.2 to 3.6%. The effect of mastitis on the total concentration of milk protein is variable (Auldlist MJ and Hubble IB., 1998). Runcevska M., et al., (2019) reported a reduction of protein content when the somatic cells are increased. Overall, total protein in milk with high SCC can remain unchanged or undergo small changes, because the content of casein decrease is accompanied by an increase in whey proteins, resulting in a negligible change in total milk protein (Ramos, T. M., et al., 2015).

In our study, there were no significant differences in total proteins, but the increased number of somatic cells leads to increasing of the whey proteins and reduction of the casein. We have noticed increased by 2 % in whey proteins when the somatic cells were over 1000×10^3 . It has been observed that milk samples from infected quarters had a higher content of whey protein, but lower casein content. Also, the lactose content was reduced compared to milk samples from healthy quarters, which correlate with the results of Forsbäck L., et al., (2010).

Table 1 Physical-chemical changes in raw milk as a result of increased somatic cell count (N=6)

Group	Fat %	Lactose %	SNF %	FPD m°C	pH	Density g/ml	Proteins %	Whey proteins %	Caseins %	%Whey proteins
1	3.8	4.7	8.99	525.7	6.6	1.031	3.2	0.6	2.6	20.1
2	3.9	4.9	9.00	537.9	6.6	1.032	3.0	0.6	2.4	19.5
3	4.7	4.6	9.1	535.9	6.6	1.030	3.6	0.8	2.8	22.5

Conclusion

This study indicates that an increased number of somatic cells leads to changes in protein fraction, fats, solids and lactose. Casein proteins decreased, while whey proteins increased. Additionally, total solids and SNF had slightly increased while fat and lactose were decreased. Although the casein content increased in group 3 as a total number, the percentual presentation is lowered below the critical limit of 80 %, for the normal processing in the dairy industry.

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