

Associations of the bovine major histocompatibility complex DRB3 (BoLA – DRB3) with mastitis and milk composition in dairy cattle

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Associations of the bovine major histocompatibility complex DRB3 (BoLA – DRB3) with resistance/susceptibility to mastitis have been documented. The BoLA – DRB3 alleles have considerable promise as potential mastitis marker. As a candidate gene for mastitis resistance/ susceptibility BoLA – DRB3 alleles have to be examined for association with milk traits.

The objective of this study was to investigate the association of two alleles (BoLA – DRB3.2*16 and BoLA – DRB3.2*23) of the bovine major histocompatibility complex with somatic cell count (indication of the inflammation of the udder), milk yield and milk composition changes in cattle.

The polymorphism of BoLA-DRB3 gene was identified in blood samples collected from 130 cows. Test - day milk samples were collected monthly. Allele BoLA – DRB3.2*16 was significantly associated with decrease of somatic cell count in milk, increase of milk yield and decrease of protein and fat content. The presence of BoLA – DRB3.2*23 allele was associated with significant increase of somatic cell count and decrease of milk yield.

Key words: *Mastitis, milk yield, milk composition, BoLA-DRB3*

Introducing resistance to mastitis into breeding programmes for dairy cattle seems to be one of the possible methods for limiting the increasing number of clinical and sub-clinical cases of udder inflammation and thus a method of improving the economic results of cattle husbandry and breeding (Sender and Reklewski 2002). Looking for candidate genes is one of the strategies introducing resistance to mastitis into breeding programmes. Two alleles of BoLA-DRB3 gene were identifying as

Summary

Introduction

affecting occurrence of mastitis (Sharif *et al.* 1998 a, Kelm *et al.*, 1997). As a candidate gene for mastitis resistance/ susceptibility BoLA – DRB3 alleles have to be examined for association with milk traits.

The objective of this study was to evaluate relationships between two BoLA - DRB3 alleles (BoLA – DRB3.2*16 and BoLA – DRB3.2*23) and somatic cell count (indication of the inflammation of the udder), milk yield and milk composition changes of Polish dairy cattle.

Material and methods

A total of 130 Polish Holstein cows in experimental farm in Jastrzębiec were evaluated for occurrence of mastitis and production traits. Production traits studied were milk yield, fat and protein content of monthly test day - recording. Also test-day milk somatic cell count (SCC) was collected monthly. Test-day SCC was log-transformed to base 10. Cows were genotyped for allelic variation in the BoLA - DRB3 gene using the PCR-RFLP technique (Ledwidge *et al.* 2001). Association between the BoLA - DRB3 alleles and somatic cell count, milk yield, fat and protein content were evaluated using the GLM procedure of SAS.

The model for somatic cell count, milk yield, fat and protein content included the fixed effects of BoLA - DRB3 genotypes, cows (repeated effect) nested in genotype, year and season of examination, parity and regression coefficient on days of lactation. In the model for somatic cell count also the milk yield was included as covariate. Linear contrast between model-adjusted least squares means of SCC, test-day milk yield, fat and protein content were used to test for differences between genotypes.

Results and discussion

In Polish Holstein cows population BoLA allele DRB3.2*16 was significantly ($P \leq 0.01$) associated with decrease of SCC in milk. This allele was also associated with production traits. It was observed increase of milk yield and decrease of protein and fat content in milk from cows carrying this allele comparing to cows carrying DRB3.2*23 or other allele (table 1). Associations were also detected between cows carrying allele DRB3.2*23 and reduced milk yield and increased fat and protein content in milk. In this group of cows somatic cell count was significantly ($P \leq 0.01$) higher than in group of cows carrying allele DRB3.2*16 (table 1). Significant associations between BoLA alleles and production traits have been previously documented (Sharif *et al.* 1998 b). However, there also have been studies that failed to demonstrate these associate (Lunden *et al.* 1993, Arriens *et al.* 1996). These findings should be viewed as preliminary and further studies will be required to confirm or reject the results.

In conclusions, the productions traits recorded in this study were significantly associated with the BoLA alleles associated also with lower or higher SCC (BoLA - DRB3.2*16 and BoLA - DRB3.2*23).

Table 1. BoLA - DRB3 genotype effects for SCC and production traits (least square mean \pm se), (n - unknown allele).

BoLA- DRB3 genotypes	Number of cows	SCC (log)	Milk yield (kg)	Fet (%)	Protein (%)
16/ n	31	5.59 AB \pm 0.45	31.80 AB \pm 2.59	4.47 Ab \pm 0.32	3.66 AbC \pm 0.12
23/ n	20	6.37 AC \pm 0.51	30.14 A \pm 2.85	4.77 A \pm 0.35	3.76 A \pm 0.13
16/ 23	6	6.41 BD \pm 0.48	31.66 \pm 2.72	4.61 \pm 0.34	3.73 b \pm 0.13
other	73	5.72 CD \pm 0.36	30.15 B \pm 2.17	4.63 b \pm 0.27	3.73 C \pm 0.10

Means differ significantly at: small letters - P \leq 0.05; capitals - P \leq 0.01.

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