



## Polymorphisms of the *ATP1A1* gene associated with mastitis in dairy cattle

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**ABSTRACT.** Mastitis affects the concentrations of potassium and sodium in milk. Since sodium-potassium adenosine triphosphatase (Na<sup>+</sup>, K<sup>+</sup>-ATPase) is critical for maintaining the homeostasis of these two ions, and is involved in cell apoptosis and pathogenesis, we presumed that polymorphism of the *ATP1A1* gene, which encodes the bovine Na<sup>+</sup>, K<sup>+</sup>-ATPase  $\alpha$ 1 subunit could be associated with mastitis. The *ATP1A1* gene was analyzed in 320 Holstein cows using PCR low ionic strength single-strand conformation polymorphism (PCR-LIS-SSCP) and DNA sequencing methods. A C/A SNP was identified at nucleotide position -15,739 in exon 17 of the *ATP1A1* gene, but it did not induce any change in amino acids. We examined a possible association of polymorphism of the *ATP1A1* gene with somatic cell score and 305-day milk yields. Individuals with genotype CC in *ATP1A1* had significantly lower somatic cell scores and 305-day milk yields than those with genotype CA. We also examined changes in Na<sup>+</sup>, K<sup>+</sup>-ATPase activity of red cell membranes. The Na<sup>+</sup>, K<sup>+</sup>-ATPase activity was significantly higher in dairy cows with

genotype *CC* compared to the other two genotypes, and the  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase activity of the resistant group was significantly higher than that of the susceptible group in dairy cows. We conclude that this polymorphism has potential as a marker for mastitis resistance in dairy cattle.

**Key words:** Dairy cow; *ATP1A1*; SNP; Mastitis; Somatic cell score;  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase