

The influence of β -lactoglobulin genetic polymorphism on morphometric characteristics of milk fat globules and milk fatty acids composition in Italian Friesian cow

M. Martini¹, F. Cecchi¹, C. Scolozzi¹, F. Salari¹, F. Chiatti²,
S. Chessa², A. Caroli³

¹ Dipartimento di Produzioni Animali. Università di Pisa, Italy

² Dipartimento di Scienze e Tecnologie Veterinarie per la Sicurezza Alimentare.
Università di Milano, Italy

³ Dipartimento di Scienze Biomediche e Biotecnologie. Università di Brescia, Italy

Corresponding author: Mina Martini. Dipartimento di Produzioni Animali. Facoltà di Medicina veterinaria, Università di Pisa. Viale Piaggio 2, Pisa, Italy - Tel. +39 050 2216897 - Fax: +39 050 2216901 - Email: mmartini@vet.unipi.it

ABSTRACT

β -lactoglobulin (β -Lg) is the major whey protein in the milk of ruminants and some non-ruminants. It was first isolated 60 years ago and a wealth of physico-chemical and biological information has been accumulated. Results of studies on the effect of β -Lg genotypes on milk production traits (milk yield, protein and fat yield) and on milk coagulation parameters have been rather consistent. In this study we evaluated the relationship between genetic polymorphism of β -Lg morphometric characteristics of fat globules and fatty acids composition of cow milk. The trial was carried out on 89 unrelated pluriparous Friesian dairy cows reared in the same herd in a medium-temperate climatic zone in the province of Pisa. All animals were fed the same diet. Individual milk samples were collected and analyzed in a triplicate. One milk sample of milk was collected for each cow and no preservative was used. Genotypes were determined by isoelectric focusing analysis of single milk sample. Milk fatty acids composition and morphometric characteristics of fat globules were analysed on each milk sample in triplicate. The frequency distribution of total measured milk fat globules was evaluated according to their size. Fat globule diameters were divided into nine classes of 1.5 μ m width: from class 1 (1.5-3 μ m) to class 9 (>13.5 μ m). Finally, fat globules were further classified into two groups: group S (1.5-6 μ m), and group L (>6 μ m). The analysis of variance was carried out to evaluate the effect of β -Lg genotype on all evaluated parameters with simultaneous adjustment for sampling season, parity, and days from calving as a covariate. As reported in literature, a higher gene frequency of the B variant of β -Lg was observed (0.59 vs 0.41). Significant effects of β -Lg genotype were observed for the percentage of the number of fat globules in the 8th (12-13.5 μ m) and 9th class (>13.5 μ m) which were higher in the AB genotype than in the other genotypes. The C20:4 ω 6 content was significantly higher in the AB genotype ($P < 0.05$) and C15:1 content was significantly higher in the AA genotype ($P < 0.05$) than in the other genotypes. Although β -Lg genotypes would seem to have limited relationships with the dimensions of fat globules of cows' milk, the higher content of C20:4 ω 6 in AB genotype is of particular interest from the nutritional point of view.