Association study of the *PRL* gene polymorphisms with milk performance traits in *Latvian Brown* cattle breed

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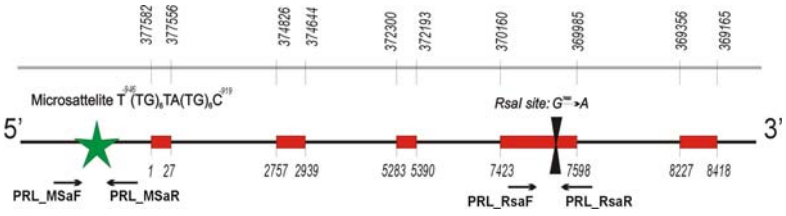
Prolactine is a polypeptide hormone with multiple functions including regulation of mammary gland development, milk secretion, and expression of milk protein genes. Bovine prolactine gene (*PRL*) was mapped on chromosome 23 and seems to be a potential quantitative trait locus of milk performance. Gene consists of 5 exons encoding the 199-amino-acid mature protein. Several single nucleotide polymorphisms of coding region (cSNP) have been evaluated previously as potential markers of milk performance traits. Allele frequency and genotype distribution of the exon IV *Rsa*I site (A7490→G) was shown as associated with milk yield and fat content in *Black-and-White* cows (Brym et al., 2004).

Goal

To genotype cSNP of G^{7490}→A of the exon IV and promoter region microsatellite (MS) in *Latvian Brown* (LB) cattle breed.

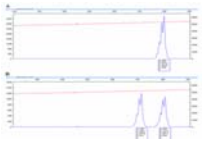
STRATEGY OF THE EXPERIMENT

Bos taurus (GeneBank:NW_001494181.1) PRL gene structure

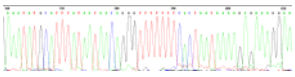


MATERIALS AND METHODS

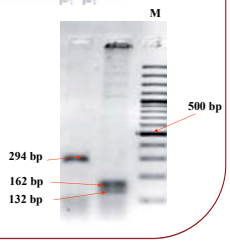
- **100 animals of Latvian Brown (LB) cattle breed**
- **Amplified fragment length sizing**



- **Sequencing**



CAPS assay (restriction site GT↓AC for *Rsa*I)**was used to genotype the cSNPG7490→A**



Results

SNP G^{7490}→ A polymorphism in *Latvian Brown cows*

Number/ frequency of alleles, bp			Number/frequency of genotypes			
N	G	A	N	GG	AG	AA
200/1,00	185/0,925	15/0,075	100/1	86/0,86	13/0,13	1/0,01

Means and standard deviation (in brackets) of milk performance traits in Latvian Brown cows with different *PRL* SNP G^{7490}→ A.

Lactation	Genotype	Animals number	Milk kg	Fat		Protein	
				kg	%	kg	%
I	GG	83	5512,69 (1228,11)	237,99 (55,98)	4,31 (0,40)	182,57 (46,21)	3,30 (0,21)
	GA	13	5758,46 (1268,48)	240,69 (47,28)	4,22 (0,49)	187,55 (40,90)	3,26 (0,17)
	AA	1	3465,00	144,10	4,16	107,90	3,11
p		97	p>0,05	p>0,05	p>0,05	p>0,05	p>0,05

***PRL* gene microsatellite polymorphism in *Latvian Brown* cows**

Number/ frequency of alleles, bp				Number/frequency of genotypes				
155	156	159	160	155/159	155/160	156/160	159/159	160/160
25/0,13	2/0,01	7/0,04	166/0,83	3/0,03	22/0,22	2/0,02	2/0,02	71/0,71

Means and standard deviation (in brackets) of milk performance traits in Latvian Brown cows with different *PRL* MS genotypes

Lactation	Genotype	Animals number	Milk kg	Fat		Protein	
				kg	%	kg	%
I	155/159	3	5909,67 (452,56)	239,70 61,02)	4,23 (0,84)	187,50 (24,65)	3,16 (0,17)
	155/160	20	5131,30 (1310,00)	218,75 47,93)	4,30 (0,37)	168,30 (39,93)	3,29 (0,18)
	156/160	2	6499,00 (240,42)	259,55 27,37)	3,99 (0,27)	206,30 (19,23)	3,17 (0,18)
	159/159	2	6297,00 (182,43)	283,05 30,48)	4,49 (0,35)	223,50 (0,42)	3,55 (0,11)
	160/160	70	5570,44 (1251,47)	240,67 57,36)	4,30 (0,41)	184,45 (48,20)	3,29 (0,22)
p		97	p>0,05	p>0,05	p>0,05	p>0,05	p>0,05

Conclusions

- **Animals with genotype AG appears to be have a higher milk yield and fat in the first lactation than cows with genotype GG.**
- **MS of (TG)6TA(TG)n motif was presented by common allele of 160 bp, rarer of 155 bp and rare alleles of 156 bp and 159 bp.**
- **LB breed cows with genotype 160/160 had a higher milk yield, fat and protein in the first lactation than cows with genotype 155/160.**