

Table 3 Average values of selection parameters of negative selection cows of Holstein exterior

Traits of exterior (points)	Cause of culling					Average value of herd
	Low production	Mastitis	Fertility defect	Difficult calving	Other causes	
Size	5.37	4.72	4.85	5.23	4.97	4.6
Rump slope	5.00	4.89	4.87	4.46	4.97	4.7
Position of hind legs	6.00	5.56	5.73	5.69	5.71	5.7
Hoofs	4.08	4.33	4.31	4.69	4.16	4.4
Fore udder	6.15	5.22	5.54	5.62	5.66	5.5
Rear udder	5.15	5.78	5.75	5.69	6.11	6.0
Udder centre ligament	4.15	4.72	4.81	4.92	4.13	4.8
Udder depth	6.69	5.89	6.48	6.38	5.89	6.1
Teats location	4.31	4.17	4.37	4.54	4.45	4.4

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THE POLYMORPHISM OF PRNP GENE IN CATTLE

VRTKOVÁ, I.¹, KÚBEK, A.², FILISTOWICZ, A.³, ŘEHOUT, V.⁴, DVOŘÁK, A.¹

¹Institute of Genetics MZLU v Brně, Czech republic, ²Department of Genetics and Breeding Biology SPU Nitra, Slovak Republic, ³Department of Genetics AR Wrocław, Poland, ⁴Department of Genetics ZF JU České Budějovice, Czech republic

Summary

The PRNP gene frequency of the allele 6 : Czech pied cattle =0,92 (113 heads); Black and white cattle = 1,00 (10 heads); Pinzgau cattle = 1,00 (13 heads); Charolais cattle = 0,93(29 heads);. The homozygous genotype of PRNP 5/5 was find only in the set of Czech pied and Charolais cattle. The gene frequency of the allele PRNP 6 in gene reservation stocks were: Czech red cattle = 0,95 (64 heads) and Polish red cattle = 0,91 (63 heads). The breeding value for milk production was higher in homozygous Sires of the genotypes PRNP 6/6 in comparison with heterozygous Sires PRNP 5/6.

Key words: PRNP gene, alleles frequency, cattle, breeding value

Introduction

The neurodegenerative disease – bovine spongiform encephalopathies (BSE) in cattle, the scrapies in sheep and Creutzfeld-Jacobs disease in humans is due to aberrant form of prion protein (PrP). This protein is sialoglycoprotein with molecular weight 27 – 30 kDa. According to various mammalian species it contains 250 – 260 aminoacids(AMA) (picture 1). Polymorphism in the third exon of the PRNP gene is created by three different alleles. They are marked as 5, 6 and 7 due to number of repeats in oktapeptides repetition in the prion protein. Alleles frequentation in various breeds of cattle are proved since half 90 - ties. Niebergs et al. (1994) found gene frequencies for the allele 6 in threere breeds of cattle: Holstein = 0,88 (94 heads), Brahman 0,95 (40 heads) and Brangus 0,95 (40 heads). Schapfer et al. (1998) described frequency of the allele PRNP 6 = 0,85 (72 heads) in the breed of Swis brown. Only in this breed was found allele 7 in very low frequency. Recently Premzl et al. (2000) described frequency of the allele 6 in original Croatian breeds and other breeds, following: Simental 0,97 (70 heads), Holstein-Friesian = 1,0 (9 heads), Istrain 1,0 (22 heads), Slavonian Syrmian = 0,63 (12 heads). Vrtkova et al. (2001 a, b) studied gene frequency in Czech republic in the stocks of gene reserve Czech red cattle as well as Polish red cattle. In this work we would give an information on PRNP gene polymorphism and association of different genotypes of Sires to their breeding value.

The prion gene in cattle is localised at 13 chromosome (Schäpfer et al., 1998). The structure of the prion gene is described by Horiuchi et al. (1998) pict. Nr. 2). The informations on prion protein are immersed in third exone and cover 4 244 bp.

Rank of AMK:	2	3	4	5	6	8	17	21	31	92	95	97	112	138	143	155	
cattle		V	K	S	H	I	S	M	V	G	G	T	G	V	L	S	H
sheep		V	K	S	H	I	S	M	V	G	G	S	S	V	L	N	Y
man		A	-	-	N	L	C	T	L	-	-	T	S	M	I	S	H
		166	168	184	186	203	205	219	231	237							
cattle		V	Q	V	E	I	M	Q	A	I							
sheep		V	R	V	Q	I	I	Q	A	I							
man		M	E	I	Q	V	M	E	-	-							

Figure 1 There is shown the differences in aminoacids composition of the prion gene of cattle, sheep and man. The aminoacids (AMA) are marked by oneletter code.

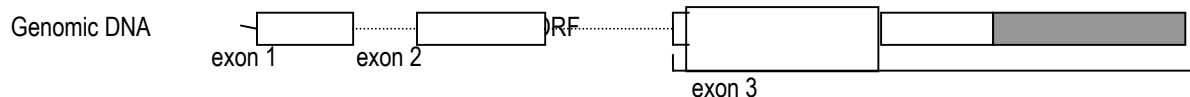


Figure 2 Scheme of the PRNP gene structure

Material and methods

DNA was isolated from the blood or hair bulbs of cattle according to Dvorak et al. (1999). The conditions for PCR, and sequencing of DNA were taken from Premzl et al.(2000). The product of PCR was analysed by 3 % agar gel electrophoresis. The shorter fragments DNA (349 bp) correspond to the allele PRNP 5, longer ones (373 bp) to the allele PRNP 6.

The tested set of cattle was composed of: 113 heads of czech pied cattle, 10 heads of Black and White (Holstein), 13 heads Pinzgau cattle, 29 heads Charolais, 63 Czech red cattle, 63 Polish red cattle. The breeding values for milk production of Sires were obtained from the records of milk production tests.

place of immersing PCR products

separation of the PCR products according to their size

Genotypes of PRNP

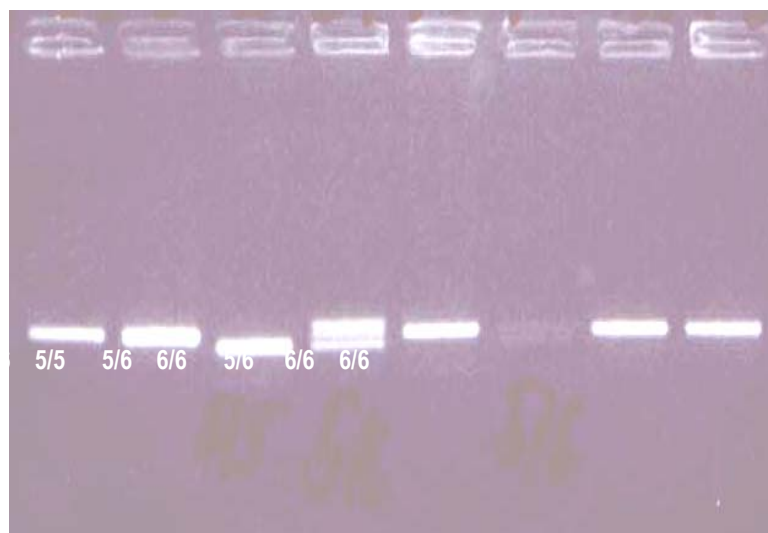


Figure 3. Result of electrophoretic separation PCR products from 3rd exon of the PRNP gene. Slower migrating products = 373 bp is allele PRNP 6, quicker migrating product = 349 bp is allele PRNP 5.

Results and discussion

There was identified three very often presented genotypes of PRNP: 6/6, 5/6 and 5/5 in the tested sets of cattle. The result of electrophoretic separation of PCR products with marking of genotypes PRNP is visualised on the picture 3. Frequentation of genotypes and alleles found in various breeds of cattle in Czech republic, Slovak republic and in Poland are presented in tables 1 and 2.

Tab. 1 The frequency of genotypes and alleles in the breeds of cattle in Czech and Slovak Republic

Breed of cattle		n	Genotypes PRNP			alleles PRNP	
			6/6	5/6	5/5	6	5
Czech spotted cattle in CR	total	113	96 84,96%	16 14,16%	1 0,88%	0,92	0,08
	Sires	66	57 86,36%	8 12,12%	1 1,52	0,92	0,08
	dairy cows	47	39 83,0%	8 17,0%	0	0,91	0,09
Black and white cattle in CR		10	10 100%	0	0	1,00	0,00
Pinzgau cattle (Slovakia)		13	13 100%	0	0	1,00	0,00
Charolais cattle (Slovakia)		29	26 89,6%	2 6,9%	1 3,5%	0,93	0,07

Tab. 2 The frequency of genotypes and alleles of PRNP gene in the gene reserves in Czech Republic and in Poland

Country	Breed	n	Genotypes of PRNP			Alleles of PRNP	
			6/6	5/6	5/5	6	5
Czech rep	Czech red cattle	64	57 89,06%	7 10,94%	0	0,95	0,05
Poland	Polish red cattle	63	51 80,95%	12 19,05%	0	0,91	0,09

We evaluated the Breeding values in the group of Sires homozygous genotype PRNP 6/6 and compared it with those of the heterozygous genotype 5/6 in the set of Czech spotted cattle. Obtained data are summarised in the table 3.

Tab. 3 The breeding values of Sires with homozygotic and heterozygotic genotypes of the PRNP gene.

Sires	n	BV milk kg	BV fatt %	BV fatt kg	BV proteins %	BV proteins kg	RBV proteins kg
Total	30	204,58	-0,13	2,65	-0,026	7,68	93,38
according to genotypes							
5/6	10	110,70	-0,075	1,30	-0,068	3,20	86,60
6/6	20	298,45	-0,185	4,00	0,016	12,15	100,15

Because low number of the Sires, presented data are only informative

It was proved, that certain genotypes of the PRNP gene are resistant to neurodegenerative disease in mice, sheep and man. Up to date such prove was not described in cattle. The association among different variants of PRNP gene and occurrence BSE are presented in the work of Goldman et al. (1994). They found two animals with BSE and all were with homozygous genotype 6/6. Neibergs et al. (1994) tested 56 animals with BSE disease and they identified 84 % with genotype PRNP 6/6 and 16 % with genotype of PRNP 5/6. They did not find any animal among infected animals with genotype of PRNP 5/5.

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OESTRUS INDUCTION AND SYNCHRONIZATION IN SHEEP DURING MILKING AND INCREASED OCCURRENCE OF EWES LAMBING TWINS

Imrich MARAČEK, Mária KRAJNÍČÁKOVÁ, Iveta DIETZOVÁ, Marián KOSTECKÝ

Research Institute o Veterinary Medicine, Košice, Slovak Republic

Summary

The aim of this work was to verify the possibilities of inducing fertile oestrus in Slovak Merino ewes during spring lactation by means of a progesterone-based preparation of Slovakian origin. We strived to provide the breeders with an effective possibility of increasing ewe fertility and milk lamb production for the pre-Christmas market. Between May and November two flocks of Slovak merino ewes were observed. On May 2nd, fourteen rams were introduced for 8 weeks into Herd A comprising 350 un milked ewes (control animals). The experimental herd (herd B) comprised 150 milked ewes. These animals were treated with vaginal sponges containing 50 mg progesterone in microcrystalline water suspension (Agolutin-Depot, Biotika a.s.). After 12 days the sponges were withdrawn and the animals received 500 IU PMSG (SERGON inj. a.u.v., Bioveta Ivanovice na Hané, Czech Republic). On day 2 after tampon withdrawal 6 breeding rams were placed in the herd for 35 days. From the results achieved it follows unambiguously that the biotechnical method employed can help to intensify reproduction (20% occurrence of twin births) in sheep herds in the milking period. The finding is original in that using an ecologically clean progesterone-based preparation positively influenced reproduction during the lactation period.

Key words: lactation, ewes, oestrus induction, twin lamb.

Introduction

It is known from our previous results that biotechnical procedures of oestrus induction and synchronization in sheep during off-season physiological anoestrus can be effectively used to solve the problem of low herd fertility rates (MARAČEK, 1995, MARAČEK a kol., 1989, 1991,1995). Nowadays, when the purpose of sheep production is undergoing transformation, milk lambs are required not only by the pre-Easter but also by the pre-Christmas market (MARAČEK, BÍREŠ, 1999, MARAČEK, HENDRICHOVSKÝ, 1994, MARAČEK a kol., 1991, 1995).

Oestrus induction and synchronization is a biotechnical method usually employing pharmaceuticals to induce fertile oestrus in a herd of a given size off the mating season, during anoestrus (in the conditions of t his country usually in the spring) and at a pre-determined time (GAMČÍK, HARTWIGH, 1988, MARAČEK a kol., 1989, 1995).

It was the aim of this work to verify the possibility of inducing fertile oestrus in Slovak Merino ewes in the spring, during the milking period, using a progesterone-based preparation of Slovak provenience. We seeked to provide the breeders with an effective possibility of increasing sheep fertility and producing milk lambs for the pre-Christmas market.