Supplemental Material

The effect of the genotypes of the *CSN2* gene on test-day milk yields in the Slovak Holstein cow

Supplemental material S1 – Genetics structure of Slovak Holstein cattle

Table S1. Genotype and allelic frequencies for *CSN2* gene in a population of Slovak Holstein cattle per breed.

Herd	Genotype frequencies			Allelic frequencies		χ2	p
	A1A1	A1A2	A2A2	A1	A2		
Herd 1	0.1496	0.4567	0.3937	0.3780	0.6220	0.104	0.9491
Herd 2	0.1379	0.4598	0.4023	0.3678	0.6322	0.011	0.9945
Herd 3	0.0159	0.6984	0.2857	0.3651	0.6349	16.163	0.003
Herd 4	0.0684	0.3632	0.5684	0.25	0.75	0.230	0.8914
Herd 5	0.0310	0.3320	0.6370	0.1970	0.8030	2.337	0.3108
Total	**0.0528**	**0.3708**	**0.5764**	**0.2382**	**0.7618**	**0.694**	**0.7069**

Table S2. The population genetic indices for *CSN2* gene in a population of Slovak Holstein cattle per breed.

Herd	$He_{(obs)}$	$He_{(exp)}$	PIC	E	ENA	V %	F_{IS}
Herd 1	0.4567	0.4702	0.3596	0.5298	1.8875	47.39	0.0287
Herd 2	0.4598	0.4650	0.3570	0.535	1.8692	47.04	0.0111
Herd 3	0.6984	0.4636	0.3561	0.5364	1.8463	47.26	-0.5065
Herd 4	0.3632	0.3750	0.3047	0.625	1.6	37.66	0.0315
Herd 5	0.3320	0.3164	0.2664	0.6836	1.4628	31.67	-0.0493
Total	**0.3708**	**0.3629**	**0.2971**	**0.6371**	**1.5696**	**36.31**	**-0.0218**

Supplemental material S2 - Multiple comparisons between CSN2 genotype groups

Table S3. CSN2 genotype Least Squares Means comparisons - milk kg

CSN 2	Milk kg LSMEAN	LSMEAN Number
11	32.6246680	1
12	32.8660110	2
22	33.0439772	3

Least Squares Means for effect CSN2
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Milk kg

i/j	*1*	*2*	*3*
1		0.4280	0.0732
2	0.4280		0.1126
3	0.0732	0.1126	

Table S4. CSN2 genotype Least Squares Means comparisons - fat kg

CSN 2	Fat kg LSMEAN	LSMEAN Number
11	1.18586792	1
12	1.18383171	2
22	1.18252520	3

Least Squares Means for effect CSN2
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Fat kg

i/j	*1*	*2*	*3*
1		0.9646	0.9056
2	0.9646		0.9322
3	0.9056	0.9322	

Table S5. CSN2 genotype Least Squares Means comparisons – fat %

CSN 2	Fat % LSMEAN	LSMEAN Number
11	3.75156951	1
12	3.70272478	2
22	3.68289739	3

Least Squares Means for effect CSN2
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Fat %

i/j	*1*	*2*	*3*
1		**0.0242**	**0.0006**
2	0.0242		0.0549
3	0.0006	0.0549	

Table S6. CSN2 genotype Least Squares Means comparisons - protein kg

CSN 2	Protein kg LSMEAN	LSMEAN Number
11	1.05678001	1
12	1.06083980	2
22	1.07193063	3

Least Squares Means for effect CSN2
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Protein kg

i/j	1	2	3
1		0.7946	**0.0381**
2	0.7946		**0.0003**
3	0.0381	0.0003	

Table S7. CSN2 genotype Least Squares Means comparisons – protein %

CSN2	Protein % LSMEAN	LSMEAN Number
11	3.30155631	1
12	3.29569765	2
22	3.31511985	3

Least Squares Means for effect CSN2
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Protein %%

i/j	*1*	*2*	*3*
1		0.7653	0.2314
2	0.7653		**<.0001**
3	0.2314	<.0001	

p < 0.05 significant differences, **p < 0.01** highly significant differences

Supplemental material S3 - Multiple comparisons between herds

Table S8. Herd Least Squares Means comparisons - milk kg

Herd	Milk kg LSMEAN	LSMEAN Number
Herd1	36.8824538	1
Herd2	33.9344846	2
Herd3	26.8113516	3
Herd4	34.0743805	4
Herd5	32.5217566	5

Least Squares Means for effect Herd
Pr > \|t\| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Milk kg

i/j	*1*	*2*	*3*	*4*	*5*
1		**<.0001**	**<.0001**	**<.0001**	**<.0001**
2	<.0001		**<.0001**	0.9831	**<.0001**
3	<.0001	<.0001		**<.0001**	**<.0001**
4	<.0001	0.9831	<.0001		**<.0001**
5	<.0001	<.0001	<.0001	<.0001	

Table S9. Herd Least Squares Means comparisons - fat kg

Herd	Fat kg LSMEAN	LSMEAN Number
Herd1	1.29921928	1
Herd2	1.19686961	2
Herd3	0.98821177	3
Herd4	1.22339508	4
Herd5	1.21267898	5

Least Squares Means for effect Herd
Pr > \|t\| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Fat kg

i/j	*1*	*2*	*3*	*4*	*5*
1		**<.0001**	**<.0001**	**<.0001**	**<.0001**
2	<.0001		**<.0001**	0.0771	0.2406
3	<.0001	<.0001		**<.0001**	**<.0001**
4	<.0001	0.0771	<.0001		0.6790
5	<.0001	0.2406	<.0001	0.6790	

Table S10. Herd Least Squares Means comparisons – fat %

Herd	*Fat % LSMEAN*	*LSMEAN Number*
Herd1	3.61123238	1
Herd2	3.64520011	2
Herd3	3.84887859	3
Herd4	3.64731172	4
Herd5	3.80936335	5

Least Squares Means for effect Herd
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Fat %

i/j	*1*	*2*	*3*	*4*	*5*
1		0.5266	**<.0001**	0.4976	**<.0001**
2	0.5266		**<.0001**	1.0000	**<.0001**
3	<.0001	<.0001		**<.0001**	0.4475
4	0.4976	1.0000	<.0001		**<.0001**
5	<.0001	<.0001	0.4475	<.0001	

Table S11. Herd Least Squares Means comparisons - protein kg

Herd	***Protein kg LSMEAN***	***LSMEAN Number***
Herd1	1.15070013	1
Herd2	1.09367916	2
Herd3	0.93432596	3
Herd4	1.06880460	4
Herd5	1.06840756	5

Least Squares Means for effect Herd
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Protein kg

i/j	*1*	*2*	*3*	*4*	*5*
1		**<.0001**	**<.0001**	**<.0001**	**<.0001**
2	<.0001		**<.0001**	**0.0182**	**0.0002**
3	<.0001	<.0001		**<.0001**	**<.0001**
4	<.0001	0.0182	<.0001		1.0000
5	<.0001	0.0002	<.0001	1.0000	

Table S12. Herd Least Squares Means comparisons - protein %

Herd	***Protein % LSMEAN***	***LSMEAN Number***
Herd1	3.17357861	1
Herd2	3.27121905	2
Herd3	3.57144039	3
Herd4	3.17548508	4
Herd5	3.32889988	5

Least Squares Means for effect Herd
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Protein %%

i/j	*1*	*2*	*3*	*4*	*5*
1		**<.0001**	**<.0001**	0.9997	**<.0001**
2	<.0001		**<.0001**	**<.0001**	**<.0001**
3	<.0001	<.0001		**<.0001**	**<.0001**
4	0.9997	<.0001	<.0001		**<.0001**
5	<.0001	<.0001	<.0001	<.0001	

p < 0.05 significant differences, **p < 0.01** highly significant differences