Effect of Calpain1, Calpastatin and Cathepsin genes and polygene on beef shear force in Piemontese young bulls

Ribeca, C.[1], Maretto, F.[1], Gallo, L.[1], Albera, A.[2], Bittante, G.[1] and Carnier, P.[1]*

[1] Dep.of Animal Science, University of Padova, viale Università 16, 35020 Legnaro (PD), Italy, [2]ANABoRaPi, Via Trinità 32A, 12061 Carrù (CN), Italy;
**cinzia.ribeca@unipd.it*

AIM

To evaluate the effect of Calpain1 (CAPN1), Calpastatin (CAST) and Cathepsin D (CTS) genes on beef shear force and drip loss in Piemontese young bulls

INTRODUCTION

The calpain-calpastatin system and cathepsin play a central role in postmortem proteolysis and meat tenderization. The effects of polymorphisms at *CAPN1 (6545), CAPN1 (4558)*, *CAST (2959)*, *CAST (282)* e CTSD (77) loci on tenderness and drip loss, have never been simultaneously investigated in Piemontese breed

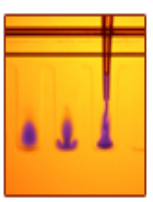
MATERIAL & METHODS

•***990*** Piemontese young bulls progeny of 109 AI sires reared in 124 farms

•***Shear force*** (SF, kg) and ***Drip Loss*** (DL,%) were measured on *Longissimus Thoracis* samples at 7 days post mortem

•***Polymorphisms*** were detected by RFPL-PCR and ARMS-PCR:

CAPN1:g.6545C>T	*ARMS*		(AF248054)
CAPN1:g.4558G>A	*RFLP*	***PsuI***	(AF248054)
CAST:g.2959A>G	*RFLP*	***DdeI***	(AF159246)
CAST:g.282C>G	*RFLP*	***RsaI***	(AY008267)
CTSD:g.77G>A	*RFLP*	***ApaI***	(AB055312)

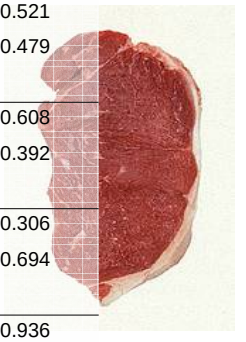


•***Additive and dominance effects*** were estimated for 672 animals by using a MIXED linear animal model, including the fixed effects of herd, age at slaughtering class, week of SF analysis and genotype at each locus, and the random effect of the animal

RESULTS & DISCUSSION

•Mean and SD for SF and DL were 2.68 ± 0.57 Kg and 4.30 ± 1.46 %, respectively

LOCUS	N	GENOTYPE	FREQ	ALLELE	FREQ
CAPN	981	GG	0.345	G	0.598
530		GA	0.505	A	0.402
		AA	0.148		
CAPN	988	CC	0.270	C	0.521
4751		CT	0.502	T	0.479
		TT	0.227		
CAST V	864	CC	0.358	C	0.608
		CG	0.498	G	0.392
		GG	0.142		
CAST	783	GG	0.108	G	0.306
2959		GA	0.394	A	0.694
		AA	0.496		
CTSD	929	GG	0.896	G	0.936
		GA	0.07	A	0.064
		AA	0.02		



•Allelic frequencies were balanced for each locus with the only exception of CTSD

Effects (SE) of genotypes at investigated loci on SF and DL

LOCUS	SHEAR FORCE, kg		DRIP LOSS, %	
	Additive Effect (α)	Dominance Effect *(d)*	Additive Effect (α)	Dominance Effect *(d)*
CAPN530	-0.035	0.054	0.131	-0.143
G	(0.048)	(0.056)	(0.119)	(0.137)
CAPN4751	0.015	0.016	-0.077	-0.149
T	(0.045)	(0.054)	(0.112)	(0.133)
CAST V	0.002	-0.042	**-0.285****	-0.146
G	(0.038)	(0.052)	(0.098)	(0.127)
CAST2959	-0.029	0.025	0.175	0.139
G	(0.042)	(0.057)	(0.104)	(0.141)
CTSD	0.016	0.124	0.046	-0.176
G	(0.096)	(0.130)	(0.236)	(0.318)

**P<0.01

•Variation of estimates was large

•Genotypes at all investigated loci did not significantly affect SF and DL except for CAST V

•The lack of effect on SF might be due to the fact that estimations were performed while accounting for the polygenic effect

CONCLUSIONS

Collagen content, proportion of stable non reducible cross-links and type of muscle fiber likely affect the variation of beef tenderness in Piemontese breed rather than genes controlling enzymatic proteolysis. The effect of CAST V on DL might be explained by its inhibitory effect on m-Calpain. Inhibition of m-Calpain seems to block the opening of drip channels, ensuring lower DL