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COLOUR AND TENDERNESS OF MUSCLES FROM HOLSTEIN-FRIESIAN BULLS (19 MONTHS) OR STEERS (24 MONTHS): EFFECT OF CARCASS SUSPENSION

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I. INTRODUCTION

Finishing male Holstein-Friesian (HF) cattle as bulls at 19 months of age can be more profitable than finishing similar animals as the more traditional steers at 24 months of age [1], but there is a perception that beef from such bulls is less tender and darker than beef from the steers. Pelvic suspension of the carcass has been shown to improve tenderness in some muscles [2]. We hypothesized that pelvic suspension would ameliorate any difference in tenderness between the bulls and steers. Our objective therefore was to compare colour and tenderness of selected muscles from bulls and steers of dairy origin and to determine the effect of carcass suspension method on these variables.

II. MATERIALS AND METHODS

Post-weaning, spring-born HF male calves, blocked by date of birth, farm of origin and weaning weight and randomly assigned to remain as bulls (B, n=15) or to be castrated (S, n=15), were turned out to pasture and managed in a rotational grazing system. Calves were castrated at 202 (SD=9.0) days of age. During winter, animals were housed within treatment group in a slatted floor shed, offered grass silage ad libitum plus 1.5 kg dry matter (DM) of concentrate head^{-1} daily and turned out to pasture in March. Bulls were slaughtered at 586 (SD=8.6) days of age after finishing indoors on a concentrates and straw ration offered ad libitum for 100 days while steers were housed in November, offered grass silage ad libitum plus 5 kg DM of concentrate head^{-1} daily and slaughtered in February at 733 (SD=8.1) days of age. Animals were transported in their treatment groups and slaughtered soon after arrival at a commercial abattoir. Post-slaughter (without electrical stimulation), carcasses were weighed, split and alternate sides suspended from the Achilles tendon (T) or the pelvic bone (A). At 48 h post-mortem, the *longissimus thoracis* (LT), *gluteus medius* (GM) and *semi-tendinosus* (ST) muscles were removed from each side, vacuum packaged for 24 h and the pH and colour (after 1 h exposure to air in darkness at 4^{0}C, wrapped with oxygen-permeable PVC film) were measured. Another section of each muscle was vacuum packaged, aged for a total of 7, 14 or 21 days at 2^{0}C and frozen, pending analysis of shear force as previously described [3]. Data were subjected to analysis of variance, separately for each muscle and ageing time, with block, animal type, suspension method and their interaction as effects in the model.

III. RESULTS AND DISCUSSION

Carcasses from B tended ($P< 0.1$) to be heavier (325 v 311 kg) and leaner (fat score 7.4 v 8.0) than carcasses from S. The intramuscular lipid concentration of LT from B and S was 43 and 76 g/kg respectively, ($P<0.05$); corresponding values for GM and ST were 28 and 31 ($P>0.05$) and 10 and 12 ($P>0.05$). Colour and shear force data are in Table 1. Stated differences are significant ($P<0.05$). Mean muscle ultimate pH for each group was within the 'normal' range (5.4 – 5.8). Muscles from B were generally lighter and less red and had higher hue than those from S likely reflecting the difference in age at slaughter. Suspension method had little effect on LT or ST colour but decreased the lightness, redness and hue of ST. There were few interactions. Shear force was higher for LT and GM from B compared to S, at each ageing time. Suspension method had little

effect on the shear force of LT and ST but decreased that of GM. After 21 days ageing, LT and GM from B and S were considered “very tender” i.e < 31.4 N [4].

Table 1. Colour and shear force (N) of muscles from carcasses of bulls and steers suspended by the Achilles tendon (T) or pelvic bone (A)

	Bulls		Steers			Significance		
	A	T	A	T	sed	Animal type	Suspension	Animal*Suspension
Longissimus thoracis								
pH	5.52	5.53	5.51	5.51	0.014	NS	NS	NS
L*	41.9	42.9	43.3	42.5	0.75	NS	NS	NS
a*	12.5	12.8	16.8	16.3	0.41	***	NS	NS
Chroma*	15.4	15.9	20.2	19.7	0.52	***	NS	NS
Hue*	35.4	36.4	34.0	34.5	0.47	***	*	NS
Shear force 7 days	34.6	36.3	21.3	19.4	2.10	***	NS	NS
Shear force 14 days	30.7	32.4	20.3	20.1	1.80	***	NS	NS
Shear force 21 days	25.9	23.2	20.3	17.1	1.26	***	**	NS
Gluteus medius								
pH	5.35	5.49	5.55	5.51	0.032	***	*	*
L*	45.5	42.9	39.9	38.2	0.62	***	***	NS
a*	14.8	14.2	16.8	14.5	0.51	**	***	*
Chroma*	18.6	17.5	20.6	17.5	0.61	*	***	*
Hue*	37.5	35.6	35.2	34.3	0.73	**	**	NS
Shear force 7 days	30.0	39.5	24.0	32.0	2.22	***	***	NS
Shear force 14 days	31.2	35.5	25.7	29.5	1.69	***	**	NS
Shear force 21 days	24.6	30.1	20.8	23.5	1.21	***	***	NS
Semitendinosus								
pH	5.54	5.53	5.53	5.55	0.014	NS	NS	NS
L*	46.2	44.7	43.6	43.9	0.53	***	NS	*
a*	13.6	14.0	12.2	17.0	0.31	***	NS	NS
Chroma*	17.7	18.0	20.5	21.6	0.44	***	*	NS
Hue*	39.8	39.2	36.7	38.2	0.64	***	NS	*
Shear force 7 days	37.9	36.0	32.0	31.6	1.49	***	NS	NS
Shear force 14 days	33.7	32.8	33.2	31.9	1.26	NS	NS	NS
Shear force 21 days	36.9	36.4	38.5	36.6	1.51	NS	NS	NS

IV. CONCLUSION

Muscles from 19 month HF bulls were generally tougher than muscles from 24 month HF steers even after ageing and carcass pelvic suspension. However after 21 days ageing LT and GM from both animals could be considered tender. GM was the most responsive muscle to pelvic suspension.

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