

# THE EFFECT OF GENOTYPE, HANGING METHOD AND AGING PERIOD ON MEAT QUALITY

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## Introduction

Currently around 47% of the beef production in Northern Ireland originates from the dairy herds. Sinclair *et al.* (2001) showed the *m. longissimus lumborum* from Aberdeen Angus breed was more tender and juicier than the Holstein breed and there was no difference between the Charolais and Holstein breeds. Sinclair *et al.* (2001) used the tenderstretch hanging method and comparisons were made at both 7 and 14 days aging. Lively *et al.* (2005) studied only Charolais and Holstein breeds and found an interaction between breed and hanging method for Warner-Bratzler shear force and WBSF after 7 days aging in the longissimus dorsi. The WBSF values were higher in Charolais (than Holsteins) when hung by Achilles tendon (4.3 and 2.8kg/cm<sup>2</sup> respectively), however the difference was less when carcasses were hung tenderstretch (Charolais 3.0 and Holstein 2.3kg/cm<sup>2</sup>). Given that increased aging leads to a reduction in WBSF values, the present experiment was designed to further investigate the interaction between aging period, genotype and hanging method.

## Materials and Methods

The experiment involved a total of 41 steers, consisting of two breeds, Holstein (HOL) and Charolais (CH). All animals were offered grass silage and libitum supplemented with 4.5 kg concentrate for 98 days prior to slaughter. All cattle were slaughtered at the same time, resulting in a range of carcass weights. At slaughter, one side of each carcass was randomly allocated to one of two hanging techniques, Achilles Tendon (AT) or Tenderstretch (TS, carcass suspended through aitch bone at 45 min post mortem until 48 h post mortem). At 3 days post slaughter the sirloin was removed, and the *longissimus dorsi* (LD) dissected out free of external fat. A slice 1 inch thick (2.5 cm) was removed from the anterior portion of the dissected LD, vacuum packed and blast frozen for further analysis. Sequential slices of similar thickness were vacuum packed and stored at 2°C until blast frozen at 7, 14 and 21 days post slaughter. Prior to measurement of cooking loss and WBSF, samples were allowed to thaw out in cold room at 4°C for 24 hours. Meat samples were removed from the vacuum bags, weighed and placed in new vacuum pack bags, for cooking in a water bath at 75°C for a period of 50 minutes. Samples were allowed to cool overnight, reweighed and ten cores (1.3cm diameter removed parallel to fibre direction from each steak for measurement of WBSF. Shear force was measured using a Instron Universal testing machine, using a Warner-Bratzler shear force attachment and cross head speed 100mm/min.

## Results and Discussion

Cooking loss and Warner-Bratzler shear force values (WBSF) were significantly affected by period of aging (see Table 1). Cooking loss was higher at 14 and 21 days aging than at 3 and 7 days aging (Table 1). WBSF values generally decreased as aging period increased (Table 1). Both cooking loss and WBSF values were significantly higher in Charolais than Holstein breed. WBSF values were significantly lower in carcasses hung by the tenderstretch method. The aging by genotype interaction shows that for the Holstein breed there was no significant change in cooking loss with aging (33.3, 31.6, 32.5, 32.1% for 3, 7, 14 and 21d respectively) whereas for the Charolais breed, cooking loss at 3 days aging (32.4%) was significantly lower than at other times of aging (34.5, 35.7, 35.1% for 7, 14, 21 days respectively). When hung by the Achilles tendon, WBSF values decreased with aging for 3 to 21 days (4.65, 4.48, 4.33, 4.04 respectively), however when hung TS WBSF values did not change with aging from 3 to 21 days (3.57, 3.69, 3.62, 3.50 kg/cm<sup>2</sup>). WBSF values for Charolais were significantly higher than for Holstein when hung AT (5.11 and 3.64 kg/cm<sup>2</sup> respectively), but not when hung TS (3.83, 3.36 kg/cm<sup>2</sup> respectively). The method of tenderstretch hanging had a much greater effect for the Charolais breed than Holstein breed. The current results show the increase in tenderness, *i.e.* lower shear force, due to the tenderstretch method of hanging, which is well documented in the literature (Sørheim *et al.*, 2001). Of particular interest is the hanging by genotype interaction. Sinclair *et al.*, (2001) showed that when hung

**Table 1:** Effect of genotype, hanging method and aging on cooking loss and shear force values of *Longissimus dorsi*

	Treatment	Cooking loss (%)	WBSF (kg/cm <sup>2</sup> )
Period Aged	3	32.3a	4.11a
	7	33ac	4.09a
	14	34.1b	3.98a
	21	33.6bc	3.77b
	Significance sed	*	**
Genotype	CH	34.4	4.47
	HOL	32.1	3.50
	Significance sed	**	***
		0.50	0.181
Hanging technique	AT	33.7	4.38
	TS	32.8	3.60
	Significance sed	NS	***
		0.50	0.181
Interactions	Aging X Genotype	**	ns
	Aging X Hanging	ns	**
	Hanging X Genotype	**	ns

Within a column means with a common superscript are not significantly different. ns not statistically significant; \* p<0.05; \*\* p<0.01 \*\*\* p<0.001.

tenderstretch there was no difference in eating quality between Charolais and Holstein breed. The current results also show the genotype WBSF values of the two genotypes to be closer when tenderstretch hung. Although the average carcass weight at slaughter of the Holsteins in the current experiment was lower than the Charolais (CH 360, HOL 281kg), covariate adjustment for carcass weight did not change the pattern of results reported in Table 1. The cooking loss and WBSF values for 7 days aging in the current studies on meat frozen after aging are higher than those reported by Lively *et al.*, (2005) when undertaken on fresh *L. dorsi*. It should be noted that the pattern of results for 7 days aging (Lively *et al.*, 2005) was similar to the current studies, with biggest genotype differences for WBSF being shown when hung AT rather than TS. Lively *et al.* (2006a) considered that the greater marbling of the Holstein breed may account for the greater tenderness in the LD muscle. The contribution of other factors such as pH/temperature decline, or proteolytic activity need further investigation.

#### Conclusion

The current results show the importance of post slaughter procedures e.g. hanging method, aging when undertaking breed comparisons.

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