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INFLUENCE OF 12 DAYS AGEING ON TEXTURE AND WATER HOLDING CAPACITY OF PORK TRICEPS BRACHII, LONGISSIMUS, AND BICEPS FEMORIS

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I. INTRODUCTION

The Australian pork industry aims to produce high-quality pork to satisfy consumer demand. This industry has used genetic selection to improve lean pork production. However, as a result of this selection pressure, there are indications that the eating quality of Australian pork is not always consistent [1]. Selection for increased growth rate may result in decreased intramuscular fat content in pig muscles which can negatively influence pork texture, and water holding capacity [2]. Some of these negative impacts on pork quality could be potentially overcome by post-mortem ageing. Two to three weeks of postmortem ageing is known to have tenderization effects in beef [2], but its benefits in pork are poorly quantified. The quality traits of the muscles *Biceps femoris* (BF) and *Longissimus thoracis et lumborum* (LTL) have been well-studied including colour, water holding capacity (WHC) and texture, but the *Triceps brachii* (TB) has not been well characterized. This research aimed to characterize the texture and WHC of three pork muscles at 0 days ageing, and investigate the response to 12 days ageing in two muscles.

II. MATERIALS AND METHODS

Three Australian commercial suppliers processed 48 female pigs each from their maternal and terminal lines (total n=144). Two silversides (containing *Biceps femoris*, BF) and bolar blades (containing *Triceps brachii*, TB), and one loin (containing *Longissimus thoracic et lumborum*, LTL) were removed from each carcass and the LTL was cut in half at the 9th rib. These primals were vacuum packed and transported to the University of Melbourne. At 48 h post-mortem, the two TB's, BF's and half LTL's were allocated to either 0 days or 12 days ageing, at 0-2°C in vacuum packaging. Analysis of line effects is not included in this abstract. The following measurements were made after 0 and 12 days ageing. EZ drip loss was measured by the weight loss of pork samples over 48 hours in EZ drip loss tubes at 0-2°C, expressed as proportion of initial weight. Samples (55 ± 5g) were cooked to core temperature 71°C then cooled for 24 hours. Cook loss was calculated as the difference in weight between before, and after, cooking and expressed as a proportion of initial weight. Warner-Bratzler shear force (WBSF), and texture profile analysis (TPA) hardness and chewiness, were measured using a Lloyd Instruments LRX Materials Testing Machine (AMETEK, Pennsylvania, USA) equipped with a 500 N load cell. WBSF was measured using a V-shaped blade at a speed of 300 mm/min, using six samples with a cross-section of 10 mm^2 and a length of 40 mm parallel to the muscle fiber direction. For TPA, a 6 mm diameter probe and double-bite compression was used on a 40 mm × 40 mm × 10 mm slice from each sample, perpendicular to the muscle fiber direction, to 80% depth at a speed of 300 mm/min with 0.1 s wait time. Hardness is the peak force during the first compression. Chewiness refers to the energy required to chew solid food until it can be swallowed. Mixed linear modelling was performed using Genstat 22nd ed. (VSN International, Hemel Hempstead, UK) for effects of muscle and ageing: Model 1: Fixed model = muscle (BF, LTL and TB); Random model = Supplier/kill date/carcass ID. Model 2: Fixed model = muscle (BF and LTL), ageing (0 and 12 days) and their interaction; with same random model used in Model 1.

III. RESULTS AND DISCUSSION

The 12 days ageing reduced WBSF, hardness, chewiness and EZ drip loss for BF and LTL (P<0.001 for all; Table 1). The BF had higher hardness than LTL at 0 days but had a greater decrease in hardness with 12 days ageing (P=0.015). The LTL had lower WBSF than BF at 0 days (P<0.001), and tended to have a greater reduction in WBSF after ageing (P=0.093). BF also had higher WBSF and chewiness than LTL and TB, and LTL exhibited the lowest chewiness among three muscles (P<0.001 for all). TB was the most tender muscle at 0 days because it had the lowest WBSF, and there was no difference in hardness between LTL and TB (P<0.001). The higher tenderness in the TB may be due to the higher content of intramuscular fat (IMF) [3]. The LTL had higher EZ drip loss than BF at 0 days but there was no difference between two muscles after the 12 days ageing (P=0.022). The BF had higher cook loss than LTL both at 0 days and 12 days (P<0.001).

Table 1 – Effects of muscle (M; *Biceps femoris* BF vs *Longissimus thoracic et lumborum* LTL vs *Triceps brachii* TB) and ageing (A; 0 d vs 12 d) on WBSF, hardness, chewiness, EZ drip loss and cook loss of pork.

Traits	Ageing	Muscle			SED[1]	*P*-value			
		BF	LTL	TB	SED[2]	$M_{BF, LTL, TB}$[1]	$M_{BF, LTL}$[2]	A	$M_{BF, LTL}$ × A
WBSF (N)	0 d	36.9	33.3	30.2	0.88[1]	**<0.001**	-	-	-
	12 d	27.6	22.2	-	0.79[2]	-	**<0.001**	**<0.001**	0.093
Hardness (N)	0 d	41.3	33.8	34.4	0.55[1]	**<0.001**	-	-	-
	12 d	36.8	31.4	-	0.60[2]	-	**<0.001**	**<0.001**	**0.015**
Chewiness (N)	0 d	17.3	12.9	14.1	0.31[1]	**<0.001**	-	-	-
	12 d	15.1	11.0	-	0.32[2]	-	**<0.001**	**<0.001**	0.46
EZ drip loss (%)	0 d	4.08	5.02	0.81	0.184[1]	**<0.001**	-	-	-
	12 d	1.82	2.16	-	0.187[2]	-	**<0.001**	**<0.001**	**0.022**
Cook loss (%)	0 d	21.7	18.5	21.1	0.71[1]	**<0.001**	-	-	-
	12 d	21.6	19.5	-	0.69[2]	-	**<0.001**	0.32	0.26

[1] SED (standard error of the difference), and *p*-value, for comparison between muscles at 0 days ageing
[2] SED, and *p*-value, for muscle × ageing for BF and LTL

IV. CONCLUSION

Overall, the BF was the least tender muscle, among the three muscles (highest WBSF, hardness and chewiness) at 0, and after 12 days ageing. TB was more tender than the LTL and the BF, (lower WBSF) and lower hardness then the BF. Both BF and LTL were improved by 12 days ageing, but this was of greater benefit to the LTL since it had greater reductions in WBSF and EZ drip loss with ageing.

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