BENCHMARKING THE RATE OF GLYCOLYSIS IN VARIOUS PRODUCT LINES OF SHEEP MEAT UNDER COMMERCIAL PROCESSING

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Electrical stimulation of muscle from slaughtered animals hastens the onset of rigor mortis. It does this by causing muscle to undergo work via anaerobic glycolysis resulting in an initial fall in pH, followed by a change in rate of decline of pH (Devine *et al.* 2004). Three different product lines including rams, lambs and mutton all conventionally chilled were evaluated for the rate of decline of pH and temperature. The aim of this study was to benchmark the effects of electrical inputs on the rate of glycolysis in these different product types at a major N.S.W. export abattoir.

In total 615 sheep from 28 different lots were assessed, with 129 lambs from 6 lots, 153 mutton from 7 lots and 207 rams from 6 lots. The animals were sourced from N.S.W. and southern Queensland. The electrical inputs used routinely by the abattoir were; immobiliser (40V, current 1.0-1.5 amps) for 40 seconds which is used immediately after stunning, spinal discharge (500-585V, 50Hz) for 3-4 seconds, which is applied approximately 1 minute after death and finally high voltage stimulation (1130V peak, 14Hz the rms V is 800V) which is applied for 100 seconds approximately 20 minutes after death. pH and temperature were measured approximately 1, 2, 3, 5, 6 and 24 hours after death and these carcases were held in chillers at an average of 4ºC. All the pH and temperature measurements were taken in the left portion of the *m. longissimus thoracis et lumborum* (loin) muscle at the caudal end over the lumbar/sacral junction.

Carcase and meat quality traits were analysed using a residual maximum likelihood (REML) procedure (Genstat 7.1 2004) for each product line, which contained a fixed effect for lot and random term for day. An exponential equation was used to predict the temperature at pH 6.0 and rate of decline for lambs and mutton CC where as a linear equation was used to predict the rams. Predicted means for different traits according to product lines are summarised in Table 1.

Table 1. Predicted means (av. s.e.d) for carcase weight (kg), GR (mm), loin pH 24 hours post mortem, rate of pH decline (k pH exp), predicted temperature at pH 6.0, % pH >6.0 at first reading (post-stimulation) and % pH >5.8 at pH 24 hours post mortem for conventionally chilled, lamb, mutton and ram carcases

Characteristic	Lambs	Mutton	Rams	av. s.e.d.
Number	129	153	207	
Weight	20.7^{a}	23.5^{b}	25.8^{b}	1.2
GR*	13.5^{b}	11.0^{b}	6.0^{a}	1.4
Loin pH_{24}	5.86^{a}	5.86^{a}	5.93^{a}	0.14
Pred temp @ pH 6.0#	23.8^{a}	21.0^{a}	21.3^{a}	4.5
K pH exp	-0.27^{a}	-0.07^{a}	N/A	0.14
				Average
% pH >6.0 @ 1st reading	51	45	77	58 % +
% pH >5.8 @ pH_{24}	41	39	47	42 % +

Means followed by a different superscript in a row (a, b) are significantly different ($P<0.05$), *Adjusted for hot carcase weight, # for the 62, 64 and 107 carcases in each category, N/A not available, +Average % across product lines.

The product categories were subject to the same amount of stimulation, yet the pH in ram carcases declined at a slower rate than that in lamb and mutton carcases as shown by the much higher percentage of carcases that had a pH greater than 6.0 at the first reading. This suggests that lamb and mutton carcases respond to different currents and pulse types of electricity (Devine *et al.* 2004). A large proportion of carcases from each of the product categories had a pH >5.8 24 hours after death. This could increase the risk of bacterial problems and reduce the storage life for chilled product (Spooncer 1993) an effect that is independent of stimulation and category. If we could vary the electrical inputs according to the requirements of each product category, we might be able to improve meat quality. However, we still have to determine the requirements of the different product categories.

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