EARLY *POST MORTEM* pH MEASUREMENTS AS INDICATORS OF MEAT QUALITY.

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BACKGROUND

The high variability in the ultimate quality of meat is a major problem to the meat industry. Meat plants need to be able to offer a product of highly consistent quality. Therefore there is a necessity for reliable methods of measuring quality in the early *post mortem* period. Various areas of meat biochemistry are being explored for this purpose. Evidence from other authors (O'Halloran *et al.*, 1997) has shown that early *post mortem* pH measurements can give useful information on the final quality of beef.

OBJECTIVE

The aim of the present work was to investigate the use of early pH *post mortem* measurements in predicting pork quality.

METHODS

Forty-two pigs were industrially slaughtered, hung and chilled in a commercial plant following standard procedures. pH measurements were taken hourly from 1 to 7 hours (h) and at 24 h *post mortem*. Pork M. longissimus dorsi (LD) was excised 24 h after slaughter and sampled for sarcomere length (Cross *et al.*, 1980) and drip loss (Honikel, 1987). Cook loss, Warner-Bratzler shear force (WBSF) (Shackelford *et al.*, 1991) and sensory analysis (AMSA, 1978) were performed on samples taken at 1, 3 and 7 days *post mortem*. Hunter Lab colour (Strange *et al.*, 1974) was measured at 7 days *post mortem* on a freshly cut steak. For the evaluation of the rate of pH decline, the individual pH values recorded were fitted to an equation as a function of time with the following shape:

$$y = A + B / (1 + D x)$$

where y is the pH value, x is the time *post mortem* in hours, and A, B and D are the parameters representing the rate of pH decline. These were estimated for each carcass. Correlation analysis was performed with the SAS system to evaluate the relationship between potential indicators and the different quality traits.

RESULTS AND DISCUSSION

pH measurements varied widely, with ranges of 1.14, 1.02 and 1.29 pH units at 3, 7 and 24 hours *post mortem*, respectively (Table 1). There was also a wide variation in the quality attributes measured from this set of carcasses (Table 2). For instance, WBSF values on day 7 ranged from 17.46 N to 47.65 N. These values decreased with ageing while a concomitant increase in sensory analysis tenderness values was observed. Low correlations were observed between most pH measurements and quality parameters. However, significant values were found between drip loss and Hunter Lab Colour L, a, b values, and early *post mortem* pH measurements (Table 3). Also pH fall rate parameter A was found to be significantly related to Hunter colour L and b. Purchas (1990) reported relationships between ultimate pH and water holding capacity and reflectance of steaks from bulls and steers. We did not find in pork any significant relationship between pH values or rate of pH fall, and ultimate quality parameters such as WBSF or sensory analysis scores. Eikelenboom *et al.* (1996) reported that ultimate pH of pork was related to WBSF and tenderness. O'Halloran *et al.* (1997) found that LD from fast glycolysing beef had a significantly lower WBSF, and rated more tender by panellists. On the other hand, Shackelford *et al.* (1994) concluded that the pH value in beef at 3 h *post mortem* cannot be used as a criterion for sorting beef carcasses into tenderness groups.

CONCLUSION

Pork quality is highly variable. Results suggest that early *post mortem* pH measurements in pork are not useful in predicting quality parameters such as tenderness and WBSF, but they could be useful in predicting variation in colour and drip loss.

LITERATURE

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TABLE 1

Minimum (min) and maximum (max) values and standard deviation (s.d.) of pH measurements at 3, 7 and 24 hours *post mortem*, and of pH fall rate parameters.

	min	max	s.d.
pH 3 h	5.25	6.39	0.33
pH 7 h	5.30	6.32	0.25
pH 24 h	5.10	6.39	0.19
Parameter D	-13.00	14.00	3.84
Parameter B	-8.00	13.00	2.69
Parameter A	4.32	6.39	0.30

TABLE 2

Minimum (min) and maximum (max) values and standard deviation (s.d.) of various parameters at 1, 3 and 7 days *post mortem*.

	1 day *post mortem*			3 day *post mortem*			7 day *post mortem*		
	min	max	s.d.	min	max	s.d.	min	max	s.d.
Hunter L			-			-	34.32	52.37	3.58
Hunter a			-			-	3.65	8.55	1.25
Hunter b			-			-	6.75	11.61	0.98
Cook loss (%)	27.80	36.28	2.22	21.86	37.78	2.62	16.71	39.65	3.30
Drip loss (%)*	0.00	7.94	2.13			-			-
Sarcomere length (µm)	1.65	2.13	0.10			-	1.63	1.97	0.07
Warner-Bratzler (N)	31.79	59.29	7.71	21.06	60.84	8.08	17.46	47.65	7.34
Sensory tenderness **	2.63	6.25	0.90	3.00	6.50	0.80	3.38	7.13	1.03

* n=30
** 1= Extremely tough, 8= Extremely tender.

TABLE 3

Pearson's correlation coefficients between pH measurements and fall rate parameters (A, B and D), with colour values at 7 days and drip loss values at 1 day *post mortem*.

	Hunter L	Hunter a	Hunter b	Drip loss (%)
pH 1 h	-0.00^{ns}	-0.38^{*}	-0.02^{ns}	-0.35^{ns}
pH 2 h	-0.17^{ns}	-0.55^{***}	-0.19^{ns}	-0.52^{**}
pH 3 h	-0.18^{ns}	-0.45^{**}	-0.11^{ns}	-0.52^{**}
pH 4 h	-0.21^{ns}	-0.51^{***}	-0.21^{ns}	-0.45^{*}
pH 5 h	-0.15^{ns}	-0.48^{**}	-0.17^{ns}	-0.42^{*}
pH 6 h	-0.21^{ns}	-0.48^{**}	-0.22^{ns}	-0.35^{ns}
pH 7 h	-0.33^{*}	-0.47^{**}	-0.33^{*}	-0.41^{*}
pH 24 h	-0.45^{**}	-0.37^{*}	-0.45^{**}	-0.36^{*}
Parameter B	0.08^{ns}	-0.08^{ns}	-0.02^{ns}	-0.17^{ns}
Parameter D	0.00^{ns}	-0.14^{ns}	-0.13^{ns}	-0.16^{ns}
Parameter A	-0.49^{**}	0.07^{ns}	-0.33^{*}	-0.09^{ns}

ns = non significant; * = $P < 0.05$; ** = $P < 0.01$; *** = P 0.001