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Star Wars Lamb… Can lasers measure meat quality?

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Meat quality is a critical factor in the consumer acceptability of meat products and consequent repeat purchases. Raman spectroscopy has been investigated as a tool for rapid, non-destructive and online measurement of meat quality indicators such as early post mortem pH in pork (Scheier *et al.* 2014), as well as tenderness of beef (Bauer *et al*. 2013) and lamb (Fowler *et al.* 2014a; Fowler *et al.* 2014b). Further investigation into the potential of Raman spectroscopy to assess meat quality is warranted, given the wide potential of the technology.

Therefore, the aim of this study was to determine whether a Raman hand held device could predict meat quality indicators at different times post mortem in ovine carcases.

Raman spectroscopy measurements were conducted on 80 ovine *semimembranosus* muscles as previously described by Fowler *et al.* (2014a) but at 25 mins, 24 h and 5 days post mortem. Meat quality indicators including pH, sarcomere length, particle size, collagen content, cooking loss, purge loss and shear force were also measured. The prediction of meat quality indicators using Raman spectra was determined using Partial Least Squares regression (Fowler *et al.* 2014a).

This study demonstrates that there is potential for Raman spectroscopy to predict pHu using Raman spectra measured at 25 min and 24 h post mortem (Table). There is also potential to measure pH_{24} at 25 min and 24 h. Furthermore, there are promising results for the prediction of purge losses at 5 days post mortem using Raman spectra measured 25 min, 24 h and 5 days. The predictive power of these models may also be improved by increasing the duration of the Raman spectroscopy measurements. No other meat quality indicators could be predicted using Raman spectroscopy ($R^2_{cv} = 0.00$).

Table. Cross validated co-efficients (R^2_{cv}) between values predicted using Raman spectra and observed values for meat quality traits with promising outcomes.

Meat Quality Indicator	Time of Spectroscopic Measurement		
	25 min	24 h	5 days
pH@ 24h	0.18	0.32	–
pHu	0.14	0.51	0.00
Purge Loss (%)	0.39	0.41	0.24

This study reveals that there is potential to predict purge loss and pHu during the early post mortem period using Raman spectroscopy. Therefore, there is potential for Raman spectroscopy to identify carcases which are susceptible to heat shortening and are at risk of increased purge losses (Jacob and Hopkins, 2014) and carcases with lower ultimate pH values. This could have particular relevance to beef, but the transportability of this finding has not been tested.

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