MEAT SPECIATION USING A HIERARCHICAL APPROACH AND LOGISTIC REGRESSION

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Food adulteration is a serious consumer fraud and a matter of concern to food processors and regulatory agencies. A range of analytical methods have been investigated to facilitate the detection of adulterated or mis-labelled foods & food ingredients but most of these require sophisticated equipment, highly-qualified staff and are time-consuming. Regulatory authorities and the food industry require a screening technique which will facilitate fast and relatively inexpensive monitoring of food products with a high level of accuracy. Near infrared spectroscopy has been investigated for its potential in a number of authenticity issues including meat speciation (McElhinney, Downey & Fearn (1999) *JNIRS*, 7(3), 145 154; Downey, McElhinney & Fearn (2000). *Appl. Spectrosc.* 54(6), 894-899). This report describes further analysis of these spectral sets using a hierarchical approach and binary decisions solved using logistic regression. The sample set comprised 230 homogenised meat samples *i.e.* chicken (55), turkey (54), pork (55), beef (32) and lamb (34) purchased locally as whole cuts of meat over a 10-12 week period. NIR reflectance spectra were recorded over the wavelength range 400-2498nm at 2nm intervals on a NIRSystems 6500 scanning monochromator.

The problem was defined as a series of binary decisions *i.e.* is the meat red or white? is the red meat beef or lamb?, is the white meat pork or poultry? etc. Each of these decisions was made using an individual binary logistic model based on scores derived from principal component or partial least squares (PLS1 and PLS2) analysis. The results obtained were equal to or better than previous reports using factorial discriminant analysis, K-nearest neighbours and PLS2 regression. This new approach using a combination of exploratory and logistic analyses also appears to have advantages of transparency and the use of inherent structure in the spectral data. Additionally, it allows for the use of different data transforms and multivariate regression techniques at each decision step.