

Survey of beef quality at retail outlets

**FINAL REPORT
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Introduction

A wide range of factors can influence the eating quality of beef available to consumers. Delivering optimum quality relies on the adoption of a whole chain approach. Individual retailers, however, adopt widely differing specifications to suit their business needs and the practices intended to improve meat quality, operated in isolation, may not be fully effective.

It is relatively easy to identify whether some practices are in place, for example hip suspension. It is less easy to identify whether the less obvious requirements (eg maturation period) have been adopted. If they have, supplier monitoring may be insufficient to ensure that they are adhered to.

The EBLEX Board is concerned that there is an undesirable, and avoidable, degree of variation in the toughness of English beef at retail.

This project is aimed at identifying whether such variation exists at the major multiple retailers in two important beef cuts. The sampling of English beef at retail also provides the opportunity to undertake some analyses to verify the origin of that beef.

One factor that may influence the eating quality of beef is variation in the age of animals at slaughter. While a definitive determination of animal age is not possible from a meat sample, an examination of collagen cross-linking could provide information on the variation in physiological age.

This project involved sampling beef from major retail outlets and undertaking shear force tests for toughness, as well as a range of tests to assess the origin and variation in age of the beef.

Objectives

To sample beef from 6 multiple retailer outlets and undertake the following assessments:

1. Shear force (toughness)
2. Isotopes and trace elements for origin verification
3. Genotype for detection of *Bos indicus* (zebu)
4. Collagen cross link quantification for variation in age

Approach

Sample sourcing

Samples were sourced from outlets representing six major retailers. Each was sampled over a period of 3 months in 2010, to provide 10 samples of sirloin steaks (*Longissimus lumborum*) and topside/toprump joints. Stores were selected to represent the distribution networks of the retailers (ie to sample from all areas in England covered by separate regional distribution centres)

The retailers sampled were:

1. ASDA
2. Sainsbury
3. Cooperative / Somerfield
4. Tesco
5. Morrisons
6. Waitrose

Standard (not premium or economy) supermarket own label product was sourced

Experimental structure summary

Joints: 6 suppliers x 10 samples = 60

Steaks: 6 suppliers x 10 samples (each a set of 3 steaks) = 60

Total = 120 samples

Sample preparation

Each sample pack was opened and prepared as follows:

A. Sirloin steaks

Two steaks were vacuum packed, labelled with control number and frozen for shear force assessment

The third steak was prepared to provide samples for the following analyses:

- genetic (Zebu) analysis
- isotope/trace element analysis for origin
- collagen cross link analysis

B. Topside joints

The topside joint were prepared to provide samples for the following analyses:

- genetic (Zebu) analysis
- isotope/trace element analysis for origin
- The remainder of the joint to be vacuum packed, labelled with control number and frozen for shear force assessment

Analyses undertaken

Genotype for detection of Bos indicus (zebu)

Commercial genotype testing for *Bos indicus* was undertaken to verify that Quality Standard Mark product does not include any beef with zebu genetics.

Isotopes and trace elements

FERA undertook isotope and trace element analysis and compared the results with reference databases to determine whether the likely origin of the beef is England.

Collagen cross link quantification

There is no known reliable test on meat for animal age. Collagen cross links change as an animal matures but there are sex and breed differences in crosslinks. It is thought that the ratio between types of crosslink can give an indication of the physiological age of an animal. Wide variation in the ratio would therefore indicate wide variation in animal ages. As this was the most speculative part of the study it was undertaken only on sirloin steaks.

Shear force analysis

Shear force analysis was undertaken at Campden BRI. This is a standard laboratory procedure for assessing meat toughness and is the main objective of the study.

Results

Test for Bos Indicus breeding

72 sirloin steak samples and 75 topside joint samples across six retailers were tested for *Bos indicus* genes and none were found, indicating that all meat tested was from European type (*Bos taurus*) cattle.

Origin verification (isotope and trace element analysis)

The origin analysis, based on the isotope and trace element analysis, indicated only two samples out of the 120 samples (topsides and steaks) analysed for isotopes for which there was any doubt that the origin was British. Even for these the analysis predicted that the samples were of British origin but the profiles were slightly unusual and may warrant further investigation.

Collagen cross link testing

Analysis of collagen cross linking was conducted on the sirloin samples to look for any evidence of extreme age affecting toughness of retail samples. There was no relationship between any measures of collagen cross linking and toughness, and no difference between retailers or abattoirs for any of the cross-links measured.

Whilst this is not definitive it suggests extreme animal age is not a major contributor to toughness variation in these retail samples.

Shear force

Sixty sirloin steak samples (ten from each of six retailers) were assessed for shear force. The results are summarised below:

Steak shear force	Maximum force (kg)	Area under the curve (kg/s)
Overall Average	4.9	12.0
Overall Minimum (most tender)	2.5	7.3
Overall Maximum (most tough)	10.0	23.9
Average for retailer with lowest value	3.9	9.8
Average for retailer with highest value	5.8	14.4
Average for slaughter plant with lowest value	3.7	8.7
Average for slaughter plant with highest value	6.4	14.0

Sixty topside/top rump joints (ten from each of six retailers) were assessed for shear force. The results are summarised below:

Topside shear force	Maximum force (kg)	Area under the curve (kg/s)
Overall Average	5.6	13.9
Overall Minimum (most tender)	3.1	8.8
Overall Maximum (most tough)	9.3	20.2
Average for retailer with lowest value	4.8	12.4
Average for retailer with highest value	6.9	15.1
Average for slaughter plant with lowest value	4.2	10.7
Average for slaughter plant with highest value	6.5	16.7

This demonstrates that there is considerable variation in the shear force of beef from the multiple retailers. Beef of very good quality is available from all retailers but variation means that some consumers will be disappointed with the toughness of beef they buy from some of the multiple stores.

Unsurprisingly, topside joints have higher shear values than sirloin steaks.

Examining the data in detail it has been possible to compare the toughness results with the practices to which meat has been subjected in the different supply chains. A clear observation is that the post slaughter practices undertaken in supply chains has an important impact on the toughness of the meat produced. In particular those supply chains where hip suspension is used group together with lower shear force values for both steaks and joint compared to those with High Voltage Electrical Stimulation or neither.

Conclusions

There is considerable variability in the toughness of beef from English abattoirs available at retail in England. While beef of good quality is available from all supply chains, variation means that there are unacceptably tough samples in several multiple retailer offerings. Those retailers specifying hip suspension, have generally lower shear values than those with other post-slaughter procedures.

The *Bos Indicus* test results show that this is not contributing to this range in toughness. Origin results suggest all the beef sampled is of British origin, and collagen cross links suggest extreme animal age is not a factor.