DEVELOPMENTS IN BEEF MEAT QUALITY

Edited by
JD Wood

CONTEXT

PREFACE

Meat is a vital part of our diet, supplying protein, iron and other essential minerals and vitamins. In Britain, beef is the flagship meat and although its consumption has tended to decline during the last 20 years, we always turn to beef on special occasions and when we eat out. Its quality, especially its eating quality, are therefore of great interest to everybody.

As with other meats, beef eating quality is variable. Despite a great deal of knowledge of the factors across the supply chain which affect quality and industry-wide programmes to apply this knowledge, tenderness, juiciness and flavour are not always as good as they could be. Work continues to unravel the reasons for this and the Langford Food Industry Conference in June 2012 was an opportunity to update us on the latest ideas.

This book summarises the papers given at that conference. New knowledge on how eating quality can be controlled includes an update to the MLC Blueprint for tender beef and a demonstration of the application of the Australian MSA beef quality improvement system in Ireland. The possibility of quality control using on-line methodology is considered in chapters on near infrared spectroscopy, a promising recent development and the integration of several on-line approaches being developed in Scotland. New developments in retail packaging, which can improve quality and reduce waste, are also reviewed.

Two chapters consider the development of beef production systems aiming to produce beef of the highest eating quality (the 'wow' factor). A chapter from EBLEX reminds us of the need to reduce production costs as well as improve quality. The final chapter gives the perspective of the retailer and shows how important eating quality is to future beef sales.

The Langford Food Industry Conference 2012 was supported financially by EBLEX to whom I am most grateful. Thanks also to Christine Rowlings, Steve Wotton and Andy Grist of University of Bristol for organisation.

Jeff Wood
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QUALITY DEVELOPMENTS IN THE ENGLISH BEEF INDUSTRY

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Abstract

A wide range of factors influence consumer acceptability of red meat. This paper reviews those factors that influence the eating quality of meat and could therefore form part of a specification for enhanced meat quality. The advantages and disadvantages of the specification approach are briefly discussed. The EBLEX Quality Standard Mark is used as an example of a specification which delivers benefits to consumers and the supply chain, and changes currently being made to the scheme are described.

Introduction

A wide range of factors influence consumer acceptability of red meat. A review undertaken for Defra in 2007 (MLC, 2007) concluded that many of the things of concern to consumers are related to perceptions which are addressed either by changes to the production system or communication. The important quality attributes that result from changes to meat's physical or biochemical properties are appearance (colour and fat content), nutritional properties (primarily fat content and type) and eating quality (texture and flavour). This paper is focused on eating quality, with some reference to visual characteristics.

There are three main approaches that can be applied to managing beef eating quality:

- Definition of the treatment (of animals, carcases and cuts) that delivers the required quality, defining a specification and monitoring to ensure that the specification is adhered to
- Understanding the effect of factors throughout the supply chain that impact on quality, recording them and then, based on models, predict the resulting eating quality of the carcase on average or the individual cuts

NEAR INFRARED AND RAMAN SPECTROSCOPY FOR ON-LINE PREDICTION OF BEEF MEAT QUALITY

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Abstract

This paper compares the potential of near infrared spectroscopy (NIR) and Raman spectroscopy for the prediction of meat quality. The differences in NIR and Raman are outlined in terms of the molecular vibrations of the target molecules and at the applied level for on line application. The potential for Raman spectroscopy to obtain more detailed interpretable spectra has been shown for the measurement of fatty profiles of adipose tissue. NIR has been extensively evaluated and although it is excellent for predicting compositional aspects, its ability to predict meat quality is less consistent. The small amount of published data on Raman spectroscopy has shown potential for meat quality prediction. The practical application of both spectroscopy methods and the need to consider general factors such as pre-slaughter handling and post-slaughter processing when developing prediction models are outlined.

Introduction

Consumers purchasing meat may use some aspects of the appearance of meat such amount of fat, colour of both fat and lean and amount of marbling as an attempt to assess its eating quality. These are not usually good predictors for eating quality within the UK. There are three broad attributes to eating quality: tenderness, juiciness and flavour. Although tenderness is often considered the most important of these attributes, flavour may also have

BEEF PACKAGING SYSTEMS TO IMPROVE QUALITY AND REDUCE WASTE

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Abstract

Meat waste is the biggest component of food waste by value in Britain. A high proportion of this waste is due to discolouration caused by oxidation. This chapter shows that changes to packaging and meat antioxidant status are important in the control of oxidation and waste reduction. In addition, new packaging systems should result in less plastic waste associated with the meat supply chain.

Modified atmosphere meat packs are bulky and whilst maintaining the bright red colour of beef and lamb better than any other packaging system, they can induce toughening and lipid oxidation. Studies on pack size show that the gas to meat ratio in modified atmosphere packs, and hence pack size, can be reduced from 4:1 to at least 1:1 without reducing the colour shelf life of sirloin steaks. Reducing the oxygen concentration in the pack from 80% to 50% did not reduce lipid or protein oxidation but it compromised the length of the colour shelf life.

Several studies reported describe the dramatic reduction in colour shelf life that occurs when meat ageing is increased from 10 to 21 days in vacuum.

Packaging meat in vacuum skin packs will reduce the use of plastic packaging materials, extend the shelf life and allow tenderisation to continue during distribution and retail display. However, there is still effort need on the part of retailers to demonstrate to consumers the benefits of this type of packaging when it results in meat of a much darker and unfamiliar colour than usual.

CLIMATE CHANGE MITIGATION IN THE BEEF SECTOR

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Abstract

Grazing animals produce methane as a by-product of the rumination process. Methane is a potent greenhouse gas (GHG). As a result, both beef and lamb have higher carbon footprints compared to more intensively produced meats or other foods. Defra has set targets for CO_2 reductions across agriculture and the industry is responding through the adoption of best practice and new science which drive greater efficiency. However, the headline figures have attracted a number of lobbying groups to lead public opinion towards a reduction in meat eating habits. EBLEX, as the beef and lamb levy body for English producers, has taken a proactive approach to understanding the science involved, to engage in the wider debate and to encourage producers to further increase their efficiency at the same time as running a financially sustainable business.

Introduction

Eat less meat and save the earth?

- Global temperatures have risen by 0.6°C over the past 300 years.
- 1998 – 2007 is the warmest decade on record, according to the World Meteorological Organisation.
- There is evidence of more precipitation in many parts of the world – an increase in 0.5 – 1% per decade in many mid and high level areas of the northern hemisphere.
- At the same time there has been a 2–4% increase in heavy rainfall events.
- In contrast there has been increased frequency and intensity of droughts in Asia and Africa.

Source: BBC Weather Centre Climate Change Facts

TESTING THE MSA PALATABILITY GRADING SCHEME ON IRISH BEEF

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Abstract

The eating quality of beef, particularly tenderness, is very important to consumers. It is affected by many on-farm and post-slaughter factors and can be variable at the point of sale. Yet the consumer cannot assess the eating quality when purchasing beef. Colour is the most important attribute as seen by the consumer but this has little to do with eating quality. To address the issue of consumer dissatisfaction with the variable eating quality of beef, Meat and Livestock Australia developed a model to predict palatability from the on-farm and post-slaughter factors that are known to affect it. The MSA grading model is based on a large database of beef samples from different cuts cooked in a number of ways and tasted by many consumers. Each sample is assessed for tenderness, juiciness, flavour and overall acceptability, each on a scale from 0 to 100. These scores are converted to the Meat Quality Score (MQS) using appropriate weightings for each attribute and given a star rating. The model was tested on Irish beef and Irish consumers and found to be as accurate at predicting consumer scores as when used on Australian beef and Australian consumers. Experiments were also carried out to see how well the model accounted for some of the factors that are particularly relevant to the Irish beef industry. There was generally a good fit for factors such as electrical stimulation, aitch bone hanging, ageing time, breed and sex. The MSA model could be used by the Irish beef industry to sort cuts into eating quality classes and reduce the amount of variation in eating quality.

Introduction

Beef is an important yet relatively expensive component in the diet of most consumers. The eating quality, or palatability, of beef, particularly tenderness, is therefore important to consumers. The palatability of beef

THOUGHTS ON BEEF EATING QUALITY FROM SCOTLAND

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Abstract

This review considers beef eating quality from the perspective of the Scottish Beef Industry and discusses some of the technologies being developed within industry and the opportunities arising from their use.

Beef production is very important to Scottish agriculture and to the Scottish economy. The quality of Scotch beef is therefore a focus for the Scottish industry. The growth of muscle and its conversion to meat is a complex process and can lead to variability in product quality. The aim of producing and processing beef is to provide a good eating experience for consumers, hence although farmers are paid according to carcase quality and weight, it is the eating quality of the product which must remain paramount in order to drive continued growth in sales. However, although application of best practice in both production and processing is important for the production of meat of consistently high eating quality, the evidence shows that some variability in eating quality will remain. Hence, it is clear that prescription of parameters such as ageing time and processing protocol cannot offer a guarantee of eating quality for consumers.

FROM KELLYBRONZE TURKEYS TO KELLYBRONZE BEEF

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Abstract

This chapter describes the author's efforts to capture the 'Wow' factor in beef eating quality by beginning to create a beef brand – KellyBronze Beef – which will stand alongside the family's famous KellyBronze Turkey brand. As with turkeys, eating quality in beef is made up of many factors, from the breed of animal, through rearing practices to all the things that have to be got right in processing. Presentation to the customer is a vital ingredient too. The Little Black Angus breed, biodiverse pastures and 42 days ageing are critical components of KellyBronze Beef. The chapter tells how we got where we are and how we might improve in the future.

Introduction

KellyBronze Turkeys was created in 1972 and it has since developed into the UK's premier turkey brand. We supply many well-known retail outlets as well as selling direct to the public using the internet and farmer's markets. In 2012, KellyBronze Turkeys will be available in the US for the first time.

Eating quality has always been the main priority and our turkeys have won many awards for their flavour and tenderness. We believe the high eating quality comes from the best breeding stock, free range production, wholesome feeds, slow growth and careful processing, including 14 days ageing. The birds dispatched in boxes to customers are accompanied by a meat thermometer and cooking guidelines from my wife, Molly who was a butchers daughter. Molly sadly died two years ago.

The company is now run by my son Paul and, although I still have a role as chairman, I have time for other things too. Having a long interest in

PROFITABLE PRODUCTION OF HIGH QUALITY BEEF

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Abstract

In 1998 the Beef Improvement Group (BIG), spurred on by the financial losses caused by the BSE crisis, embarked on a programme with the aim of developing an efficient beef breeding system to profitably produce high eating quality beef.

A 4-breed composite beef breed, Stabiliser™, developed in the USA, is at the heart of the system. This breed is efficient, lean and robust and is proving very popular with British breeders. The physical performance of the breed has been shown to be higher than the average of the top third EBLEX recorded herds and financial returns are correspondingly higher. Stabiliser breeders have significantly improved genetic gains over the last 6 years, leading to a large increase in beef value. A new research project to measure net feed efficiency is expected to reduce costs even further.

The eating quality of Stabiliser beef has been shown to be high and the Givendale brand is now being promoted by local butchers and restaurants. For the volume market, a ground – breaking marketing arrangement has been established with Morrisons / Woodheads which will ensure a secure, traceable, auditable supply chain for producers, retailer and consumers.

Introduction

British beef producers have never been paid for producing consistent high eating quality beef. 'Quality' has always been measured using the EUROP grading system as the benchmark and farmers have financially been rewarded in the market place for producing heavy, lean, highly-muscled carcasses

BEEF QUALITY ACROSS THE SUPPLY CHAIN: RETAILERS AND CONSUMERS

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Abstract

Waitrose is a major British retailer which is presently increasing its sales across all food areas despite the difficult economic climate. At the heart of our business is an emphasis on quality and in the beef sector the main drivers are consistent eating quality and reducing production costs. All our beef is British, coming from farmers in our Livestock Schemes and being processed by our dedicated beef processor, Dovecote Park. Our short supply chain ensures high integrity of the products on sale to customers. In the future, the aim will be to ensure security and continuity of supply, optimal efficiency, environmental sustainability and stakeholder engagement.

Introduction

At present, the double dip recession is foremost in many consumers minds as they seek to get the best value in the market place from their disposable income. As a consequence, the trading environment which Waitrose is operating in is extremely competitive as it is for other food retailers. Across the high street there is a multitude of promotional activity which consumers are acting upon. Our challenge is to remain relevant to our customers, providing them with great tasting food which represents good value to them while retaining our ethical credentials, particularly in relation to animal welfare.

In the short to medium term, there appears to be little in the way of respite from the economic gloom. The latest retail sales figures for June 2012 shows that sales were up just 0.1% compared with June 2011. Despite that however, the week of the Diamond Jubilee celebrations saw Waitrose

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DEVELOPMENTS IN BEEF MEAT QUALITY

Edited by JD Wood

Beef is a special meat for most people, the meat of choice when we eat out or plan a family meal. We enjoy beef when it is tender, juicy and full of flavour and we are disappointed when it falls short in these respects. As with other meats, quality is variable, including the eating qualities and aspects important at retail level such as colour and shelf life.

This book reviews recent progress in our understanding of the causes of variation in beef meat quality that impact at different stages from production to retail; and how the various aspects can be controlled. Developments in on-line methods for predicting and categorising quality are reviewed. The development of beef production systems aiming for high meat quality in the end product is described and the importance of tight control over supply chains to ensure consistent, reliable products for consumers is emphasised. Recent information on ways to increase production efficiency and reduce the environmental impact of beef production is presented.

The book summarises papers presented by speakers at the Langford Food Industry Conference in June, 2012. The conference was sponsored by EBLEX.

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