

A Scottish system for integrated measurement of meat eating quality

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Meat quality



Carcass Quality





Moderately Abundant

Slight

Lean Fat Bone

Moderate

Tenderness Juiciness Flavour

Meat Eating

Quality

Nutritional Quality



Proteins Fatty acids Minerals

Carcass quality – Computer tomography





Carcass quality – CT & Video Image Analysis





Computer tomography ("reference method") Muscle CT & Total meat VIA r = 0.896

Fat CT & Total fat VIA r = 0.732



Video Image Analysis

Selection of the most informative primal cuts for prediction entire carcass muscle weight SRUC

- Carcass muscle weight (94.8 kg ± 14.6 kg)
 - 5th to 10th rib muscle weight
 - 5th to 10th rib total weight
 - Hot carcass weight

R² = 0.95; RMSE = 3.52







Healthy beef



Beef

- Very tasty source of food
- High quality protein
- Array of micronutrients
- Concern
 - High concentration of saturated fatty acids
 - Obesity
 - Cardiovascular disease
- Improvement
 - Change in fatty acid profiles



Moderate

Moderately Abundant

Slight





Technological and sensory quality



- Technological quality
 - Shelf-life (lipid oxidation)
 - Colour (myoglobin oxidation)
 - pH values
 - Water holding capacity
- Sensory quality
 - Tenderness
 - Juiciness
 - Flavour





Near-infrared (NIR) spectroscopy to predict tenderness of beef



Rump (biceps femoris)



NIR & physical tenderness measurements:

r=0.72 Slice shear force (14 days)





Near-infrared (NIR) spectroscopy to predict numerous meat eating quality





Near-infrared (NIR) spectroscopy to predict fatty acid profiles





NIR measures & individual fatty acids: r=0.78 Palmitic acid (C16:0) r=0.68 Stearic acid (C18:0) r=0.79 Oleic acid (C18:1) r=0.78 Linolenic acid (C18:3)



stearic acid: an 18 carbon saturated fatty acid

oleic acid: an 18 carbon unsaturated fatty acid

Omega-3 PUFA reduce cardiovascular disease risk



Prediction of meat eating quality traits by hyperspectral imaging





Conclusions NIR



- NIR is able to predict meat quality characteristics
- NIR can be used on-line measurement
 - Early (in the abattoir)
 - Fast
 - Non-invasive
 - Cost-effective
 - Simultaneous measurements of all meat eating quality traits
- Implementation
 - Value-based marketing system
 - Sorting of carcasses
 - Feedback system to the industry
 - Genetic improvement programmes

Genomic selection for meat quality



- SNP-Chip identifies >770,000 genomic markers
- Identify genes associated with meat eating quality







Rumen microbiome and meat quality





Rumen microbiome & meat quality









- The research on beef meat quality is funded by the Scottish Government and QMS
 - Other collaborators are shown below



What is NIR measuring?



SRUC

Correlations between groups of fatty acids and absorbance

