



Agriculture & Horticulture
DEVELOPMENT BOARD



Beyond VIA: Measuring carcass and meat quality

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Overview

- What do we want to know?
- What tools do we have now?
- How might we use them better?
- What might we have in the future?





What do we want to know?



Components of meat quality



- Carcase
 - Composition
 - Dimension
- Meat
 - Sensory
 - Technological
 - Nutritional
- Hygiene
 - Pathogens
 - Shelf life
 - Residues
- Ethical
 - Animal welfare
 - Environmental impact
 - GM



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Why?



- Value for paying supplier
- Efficient processing
- Value to customer



Measure or predict?





Current tools



Weight



Carcase quality



Measure

- Weight
- pH

Predict

- Meat yield
- Fat composition?
- Meat quality?

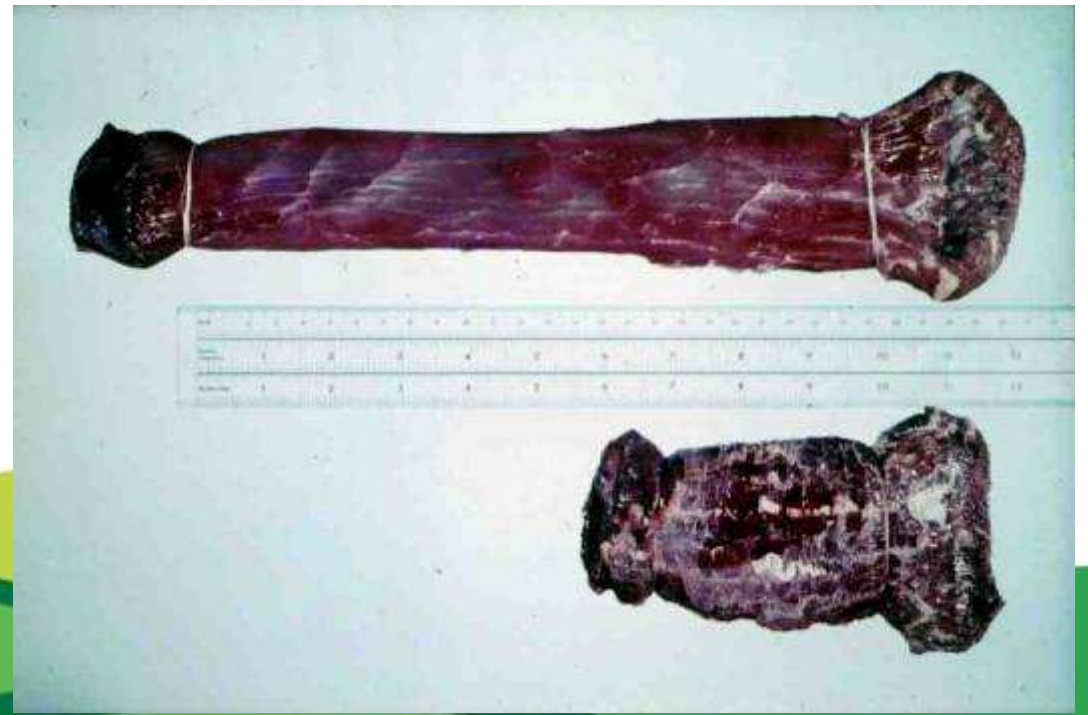




pH/temperature for optimal tenderness in lamb



- Hot shortening
 - pH of <6 when temperature is $>35^{\circ}\text{C}$
- Cold shortening
 - pH of >6 when the temperature is $<18^{\circ}\text{C}$ / $<8^{\circ}\text{C}$



pH results over 5 lamb plants



Number of carcasses	152
Number with temperature of 18°C or less at pH 6	35
Number with temperature of 8°C or less at pH 6	0
Number with temperature of 35°C or more at pH 6	32
Number with ultimate pH over 6.0	0



Carcase classification

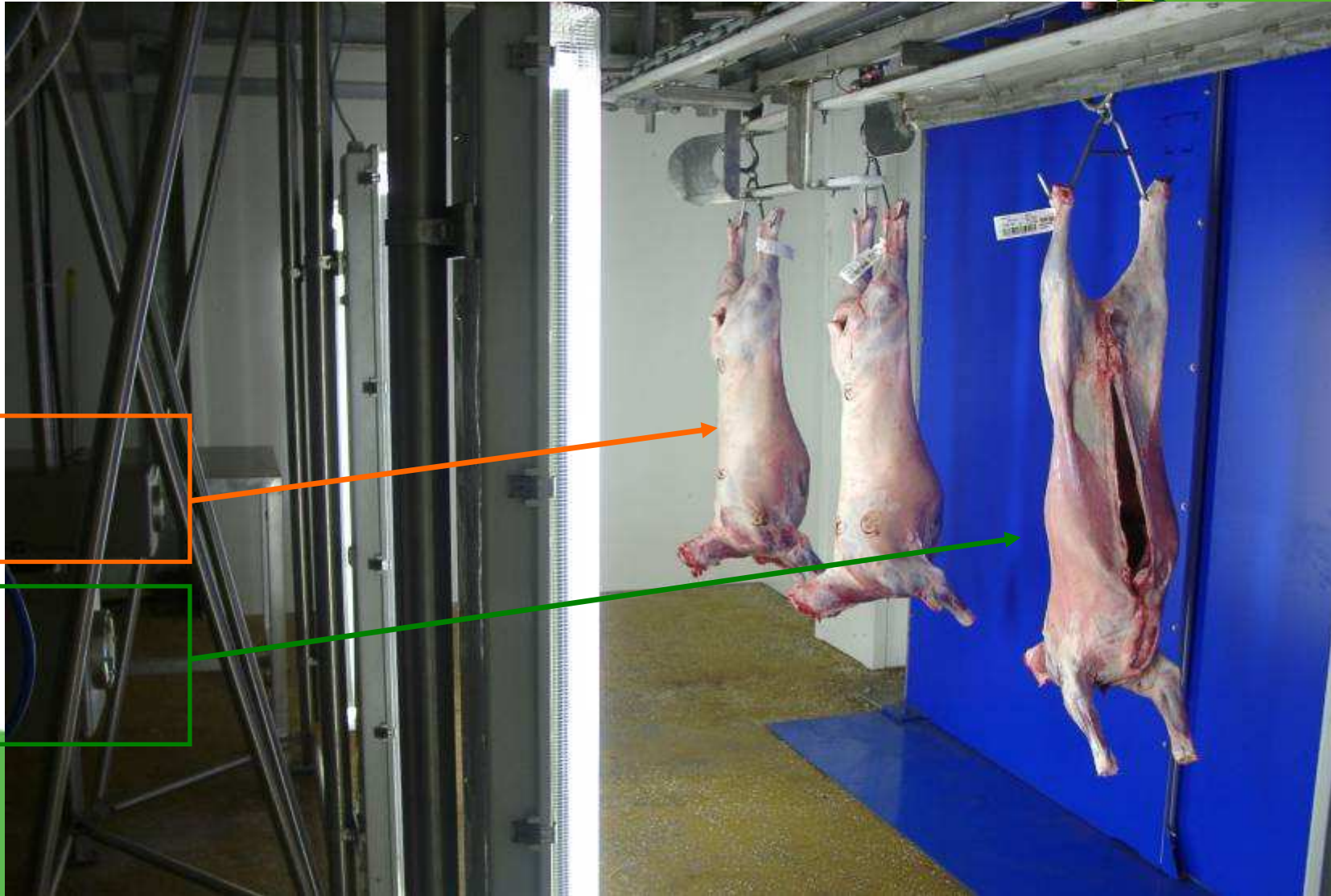
- Assessment of shape (conformation) and fatness against a visual scale
- Value
 - prediction of yield
 - matching carcasses against requirements



E+V VIA Technology



E+V VIA Technology



Back

Side

Ability of classification score or VIA to predict primal yields



<i>Trimmed primals</i>	MLC ¹		VIA	
	R ²	RMSECV	R ²	RMSECV
Leg	94	0.257	97	0.184
Chump	92	0.284	94	0.253
Loin	89	0.337	89	0.330
Breast	82	0.433	86	0.382
Shoulder	95	0.222	96	0.209
Total primals	99	0.101	99	0.087

¹adjusted for carcass weight

Rius-Vilarrasa *et al*, 2009



Heritability of VIA traits

Trait	Heritability
Length leg to shoulders (cm)	0.25
Length hock to legs (cm)	0.44
Length hock to shoulder (cm)	0.46
Back area of the carcasse (minus legs, cm ²)	0.34
Back area of the legs (minus legs, cm ²)	0.53



Future opportunities





Better use of carcass data

- For selection (feedback)
 - Requires individual animal ID
 - Direct carcass trait EBVs?
- For sorting
- To determine value



New tools for carcass assessment?

- Cost-benefit



Sensory properties of meat



- Tenderness
- Flavour
- Juiciness
- (Colour)



Components of tenderness



- Degree of muscle fibre shortening at rigour
- Connective tissue
- Proteolysis
- Fat content?



Options for tenderness measurement



- Degree of shortening (pH/temp)
- Proteolytic enzymes
- Products of proteolysis
- Mechanical
- Spectral approaches
 - Raman
 - NIR



Hyperspectral imaging

- Multiple NIR spectra
- Image analysis
- Prediction of meat quality from the total and lean only spectra of the LD



Potential of hyperspectral imaging for assessing meat quality (from Bruce Moss AFBINI)



Property of interest	Digital imaging (visible region)	NIR reflectance (350 to 2500nm)	Hyperspectral imaging (900 to 2500 nm)
Eye muscle area	✓✓✓	NA	✓✓✓
Yield prediction	✓✓	NA	✓✓
Marbling	✓✓✓	NA	✓✓✓
% intramuscular fat	✓	✓✓✓	✓✓✓
High pHu (DFD)	✓	✓✓✓	✓?
Tenderness	NA	✓✓	✓✓
Juiciness	NA	✓✓	✓✓
Fatty acid profiles	NA	✓	✓✓

Correlations with parameters of interest



Variable predicted	total	lean
WBSF D14	0.46	0.56
WBSF D21	0.42	0.41
Tender D14	0.49	0.51
Juicy D14	0.48	0.47
Flavour D14	0.46	0.47
Overall liking D14	0.45	0.44



Question

- Is lamb toughness a problem anyway?
(aside from shortening)



Flavour



- Maillard reaction products ←
- Oxidation products
- Taints
- > 1000 compounds identified as involved in flavour



Summary



- Meat quality is complex!
- Targets for measurement (prediction):
 - Fat content of lamb carcasses
 - Fatty acid composition
 - pH probe that logs over time
 - Tenderness
 - Flavour precursors?





What would you target?

