

Challenges and Opportunities - Meat Quality

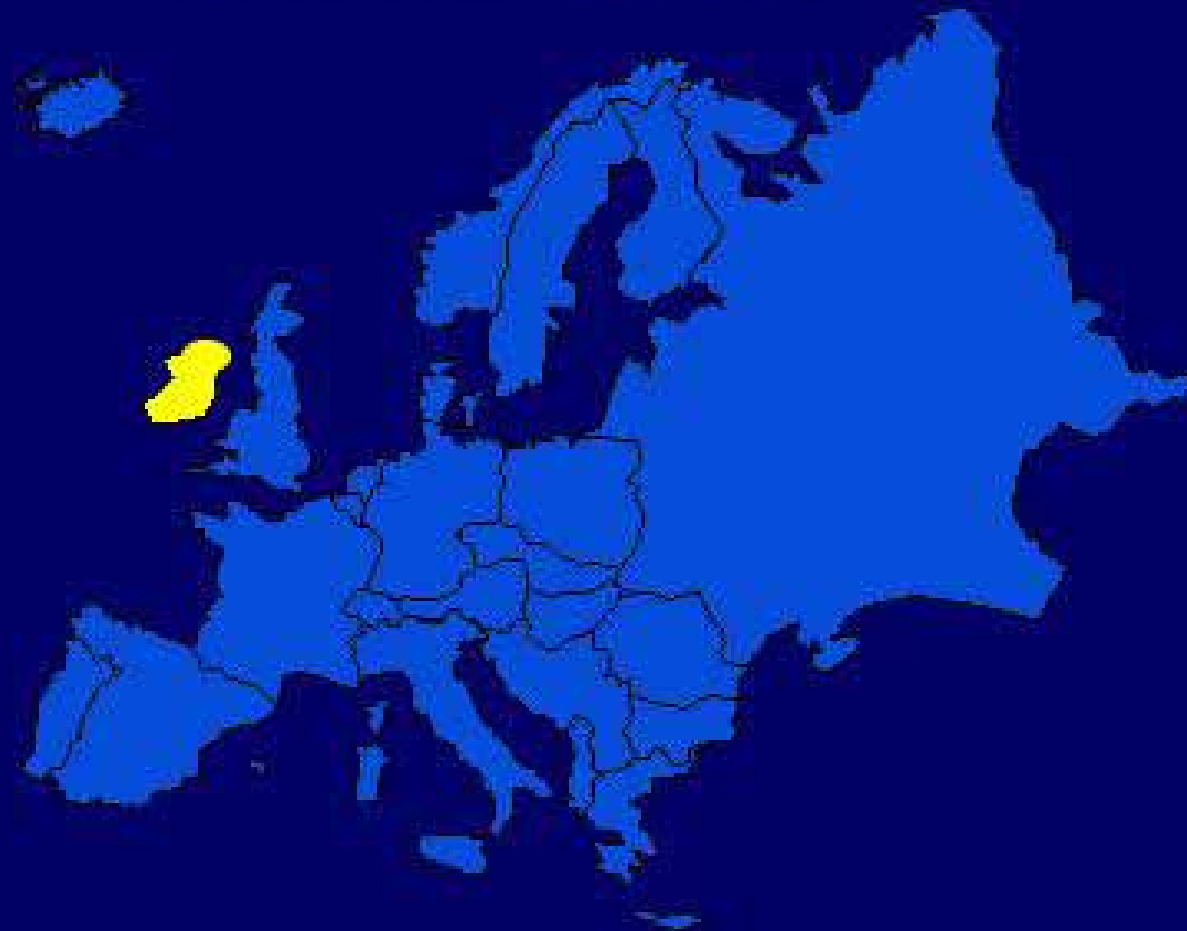
Paul Allen

Ashtown Food Research Centre

Teagasc



Introduction



Teagasc

- National agency for research in agriculture and food (7 major research centres)
- Advice and training of farmers and food industry stakeholders
- To enable the highest standards of consumer safety, food quality and nutrition to be achieved in Irish food products.

The National Food Centre

Main Activities:

- Meat Technology
- Food Safety
- Market Studies
- Training
- Innovation Management
- Technology Transfer
- Consultation



Overview

- ☛ What is meat quality?
- ☛ Perception of quality
- ☛ What factors are known to affect it?
- ☛ What are the challenges and opportunities?
- ☛ Summary

What is meat quality?

- ☛ No universal definition
- ☛ Means different things to different people – between and also within countries/regions
- ☛ Different criteria at each stage of production chain
- ☛ Will change over time

Perception of quality Producer

- ⌘ Weight
- ⌘ Conformation
- ⌘ Fatness
- ⌘ Feed efficiency
- ⌘ Growth rate

Perception of quality

Primary Processor

☞ Cleanliness

☞ Weight

☞ Yield

☞ Conformation

☞ Fat content

☞ Sex

☞ Age

☞ Bruises etc

☞ pH

☞ Colour

☞ Marbling

☞ Traceability

Perception of quality

Secondary Processor

☛ Fat content

☛ WHC

☛ pH

☛ Yield

☛ Traceability

Perception of quality

Consumer

INTRINSIC

☞ At point of sale:

- Colour
- Fatness
- Drip
- Nutritional

☞ On cooking:

- Aroma
- Shrinkage
- Exudate

☞ On eating:

- Tenderness
- Juiciness
- Flavour

EXTRINSIC

☞ Safe

☞ Traceable

☞ Animal welfare

☞ Organic

☞ Outdoor reared

Factors affecting meat quality

Pre-slaughter

- ☛ Breed
- ☛ Genetic
- ☛ Sex
- ☛ Age
- ☛ Feeding
- ☛ Handling
- ☛ Stunning method

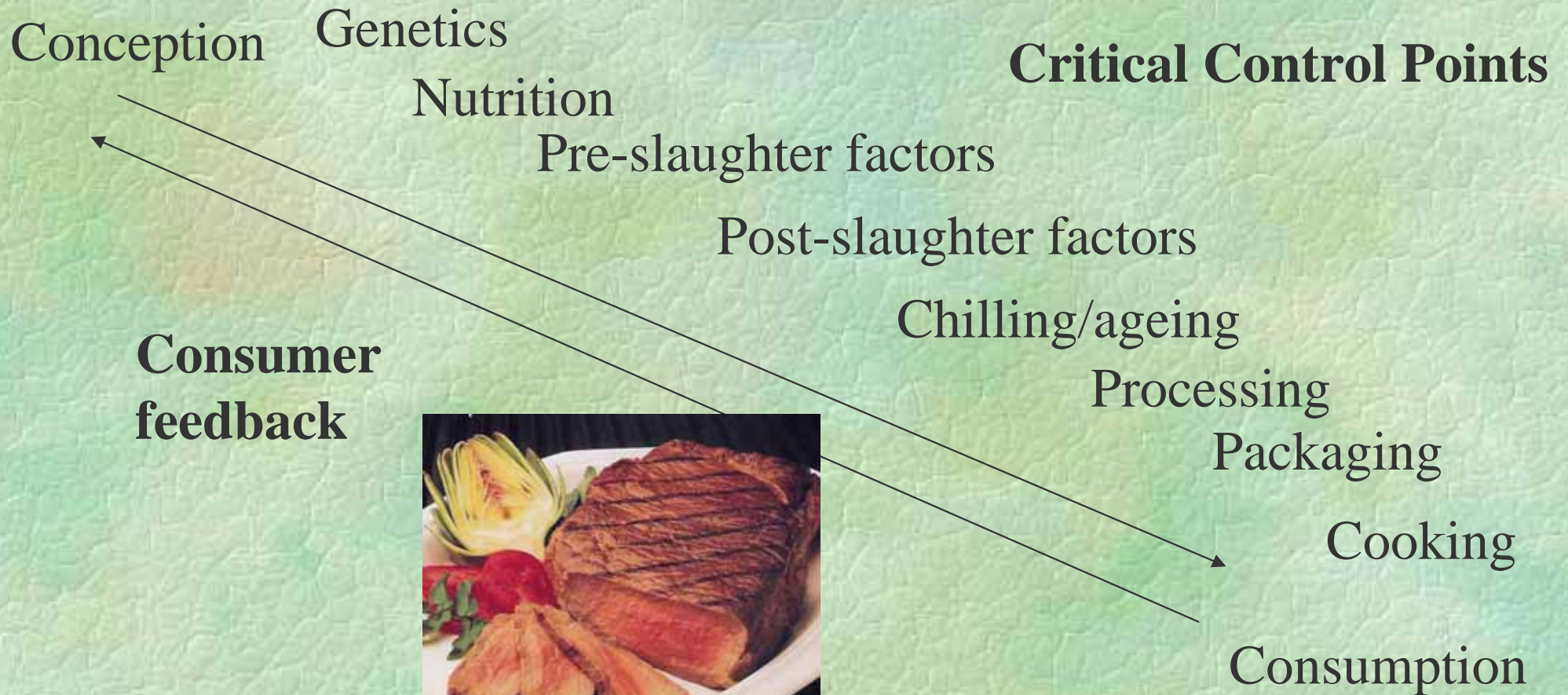
Post slaughter

- ☛ Stimulation
- ☛ Scalding/singeing
- ☛ Hanging method
- ☛ Chilling rate
- ☛ Ageing time
- ☛ Ageing method
- ☛ Packaging
- ☛ Cooking

Colour

- ☛ Fat colour affected by feeding - grass fed = more yellow
- ☛ Lean colour depends on oxidative state of myoglobin
- ☛ Affected by total pigment content, feeding
- ☛ Changes to production system affect acceptability

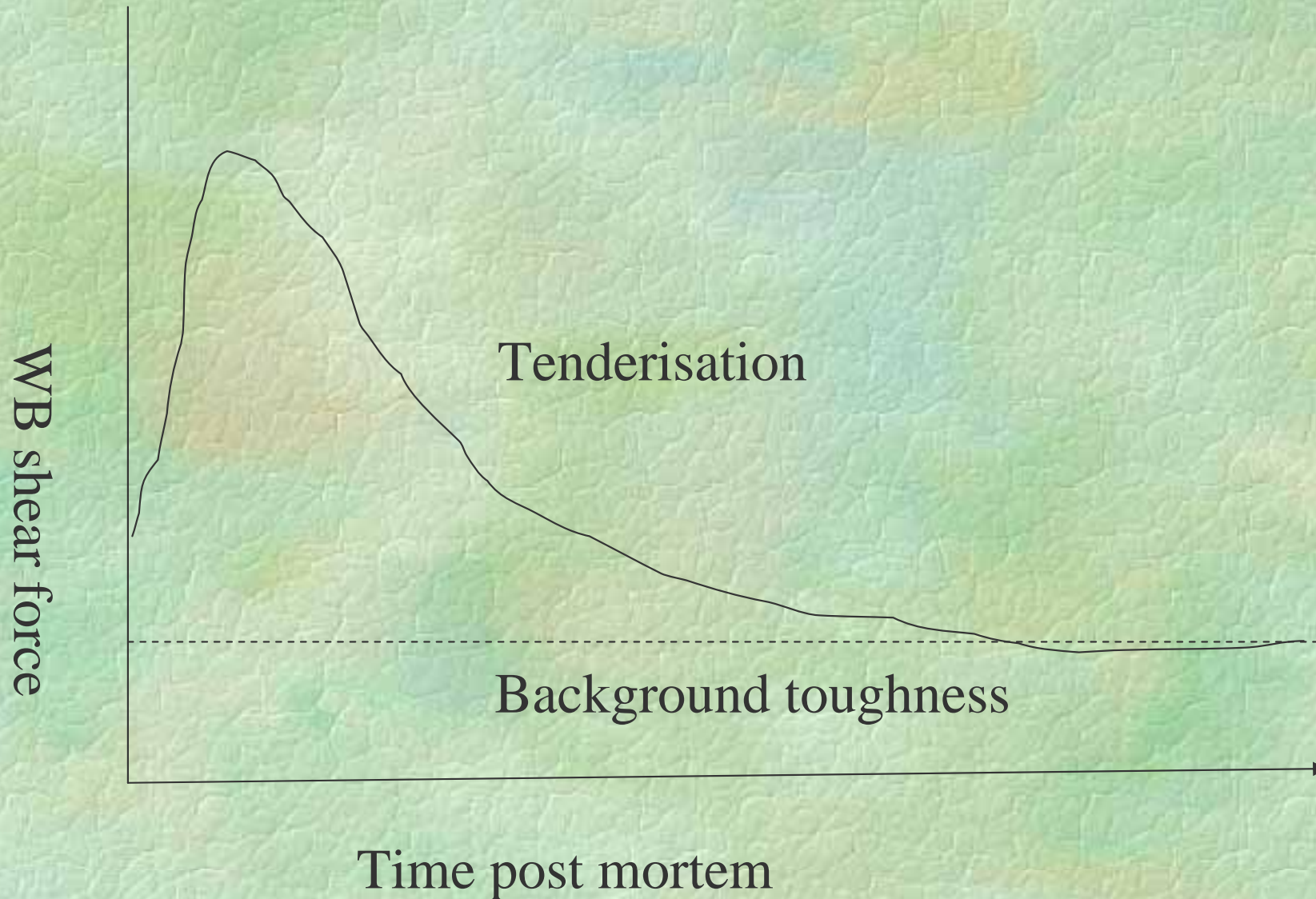
The PACCP approach



Tenderness

- ☛ Most important criterion for consumers
- ☛ Affected by many pre and post slaughter factors
- ☛ Two components - connective tissue and myofibrillar

Meat tenderness



Background toughness

Component	Affected by
Collagen content	Breed, sex, age, genetics, production system
Collagen state	Age
Fibre type	Breed
Fibre size	Breed
IMF	Breed, feed, genetics

Post rigor tenderisation

- ☛ Caused by proteases
- ☛ Potential fixed at slaughter
- ☛ Post slaughter treatment to release potential
- ☛ May be genetic differences
- ☛ May be affected by feeding system/growth rate
- ☛ May be affected by packaging method

Juiciness

- ☞ Influenced by fat content
- ☞ Not related to total moisture content
- ☞ Ability to retain moisture during cooking
- ☞ Freezing/thawing have major effect



Flavour

- ☞ Maillard reaction - amino acids produce meaty flavour, lipids species effect
- ☞ Local tastes
- ☞ Fat plays important role - many volatiles are fat soluble
- ☞ Feeding - grass v concentrates
- ☞ Age - older animals have stronger flavour
- ☞ Ageing - more gamey flavour
- ☞ Packaging - oxidation of fats (PUFA more susceptible)

Manipulation of fatty acids

- ☛ More difficult in ruminants than monogastrics
- ☛ Grass fed beef and lamb has more PUFA, CLA
- ☛ Red clover increases PUFA
- ☛ Can be altered by feeding different fats in concentrates - though should be protected
- ☛ Proportion of PUFA decreases with fatness so leaner animals have higher P:S

Summary of pre-slaughter factors

Factor	Effect	Examples
Breed	Small	Duroc, Brahman
Genetics	Large	Hal, RN genes
Sex	Small	Boar odour
Age	Small	Cows
Feeding	Medium	Grass v Concentrates
Handling	Large	PSE/DFD

Summary of post slaughter factors

Factor	Effect	Examples
Stimulation	Variable	Cold toughening
Hanging method	Medium	Tenderness
Chilling rate	Large	Cold shortening
Ageing time	Large	Tenderisation
Ageing method	Small	Flavour
Packaging	Small	High oxygen
Cooking	Large	Tenderness, juiciness

Some opportunities and challenges for improving meat quality

- ☞ IMF– affects tenderness, juiciness and flavour, increased by concentrates, some breed differences, moderately heritable but correlated with overall fatness, marker genes etc.
- ☞ CHALLENGE - to increase IMF without increasing total fat, through breeds, genetics, feeding

Challenges (2)

- ☛ Production systems – organic, outdoor, welfare friendly – generally small or negative effect on quality – strategies to improve quality
- ☛ CHALLENGE - alternative, sustainable, verifiable and traceable systems that produce safe high quality meat products

Challenges (3)

- ☛ Local/traditional breeds (species) – better quality?, characteristic qualities – niche markets
- ☛ CHALLENGE - Characterise meat and products from local/traditional breeds and species, identify specific qualities - branded products, develop traceability systems

Challenges (4)

- ☛ Healthier meat – modified fatty acids, meat products with beneficial fatty acids, nutraceuticals, natural ingredients, reduced salt, nitrate
- ☛ CHALLENGE - develop production/processing strategies to produce meat with positive health benefits

Summary

- ☛ Quality becoming more important to consumers
- ☛ Many factors affect eating quality - whole chain approach essential
- ☛ Challenge to organise chain to produce consistent quality
- ☛ Offers opportunities to improve or offer choice
- ☛ Research must be directed to whole chain