



# Key Factors Influencing Beef Eating Quality

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AFBI Food Science Branch

# Meat Research at AFBI

## Agriculture Branch Hillsborough

- Livestock genetics research
- Ruminant efficiency
- Sustainable livestock systems
- Animal behaviour and welfare



## Food Science Branch Newforge

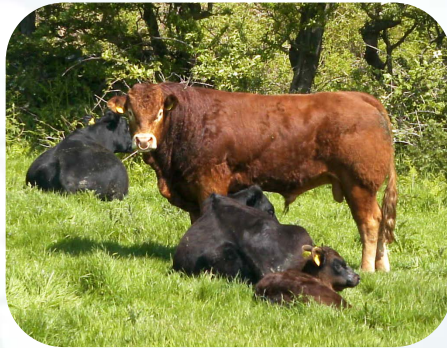
- Maximising quality and adding value
- Chemical & microbiological safety
- Effective processing



**Quality assured:** all AFBI R&D is certified under ISO9001:2000

# Producer

Genetics  
Nutrition  
Husbandry  
Conformation  
/ fat class



# Haulier

Animal welfare  
& handling



How do we improve it?

# Abattoir

Lairage  
Electrical stimulation  
Hanging method  
Chilling rate  
Ageing



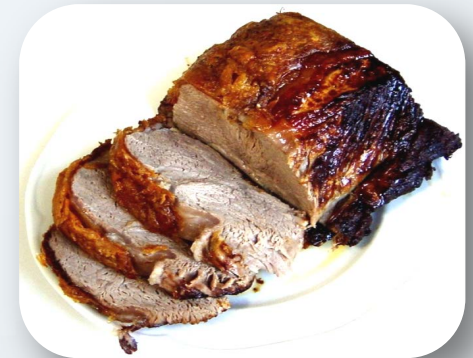
# Retailer

Cuts & muscles  
Packaging  
Shelf life



# Consumer

Cooking Method  
Nationality



# PRODUCER

## Genetics, Nutrition & Husbandry:



### Cattle types sent for slaughter:

steers 38 %  
heifers 28 %  
cows 19 %  
young bulls 12 %  
old bulls 3 %



*Source: BovIS 2009-2013*

### Conformation:

E 0.4 %  
U 14.4 %  
R 35.3 %  
O<sup>+</sup> 12.7 %  
O 9.6 %  
O<sup>-</sup> 9.3 %  
P 18.2 %



### Fat class:

1 7.6 %  
2 24.5 %  
3 45.6 %  
4 10.8 %  
4 7.1 %  
4 3.3 %  
5 1.2 %

**This  
diversity is  
breed  
driven**

# ABATTOIR

**Lairage:** Avoid stress to avoid glycogen depletion  
& ensure low pHu



**Electrical stimulation:**  
Optimise rate of pH decline and  
avoid 'heat' shortening



**Hanging method:**  
Achilles & Aitch bone  
Sarcomere stretch



**Chilling rate:**  
Optimise rate of pH  
decline & avoid 'heat'  
shortening

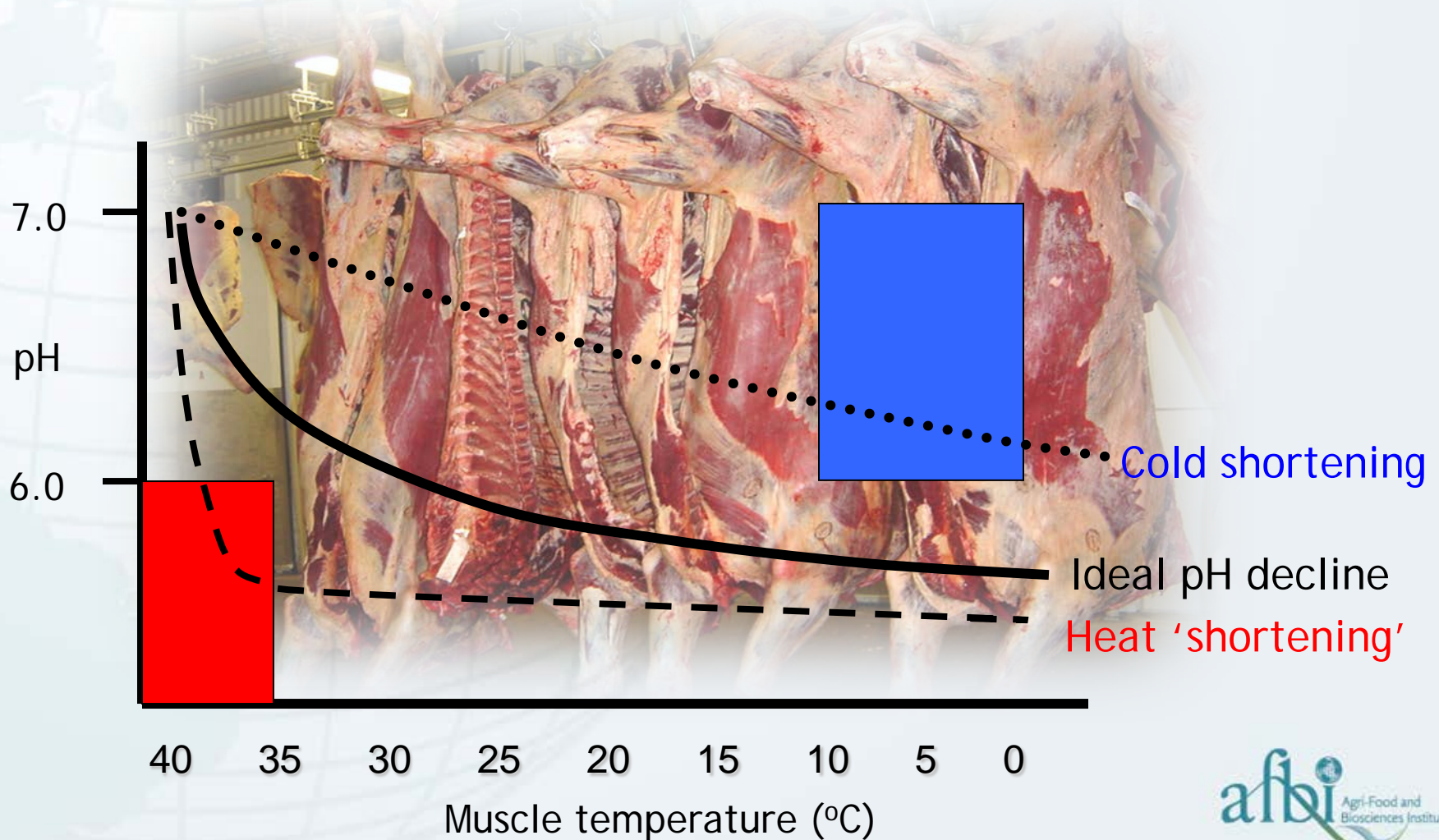
**Ageing:**  
Tenderness & flavour



**Considerable  
AFBI research  
on these topics**

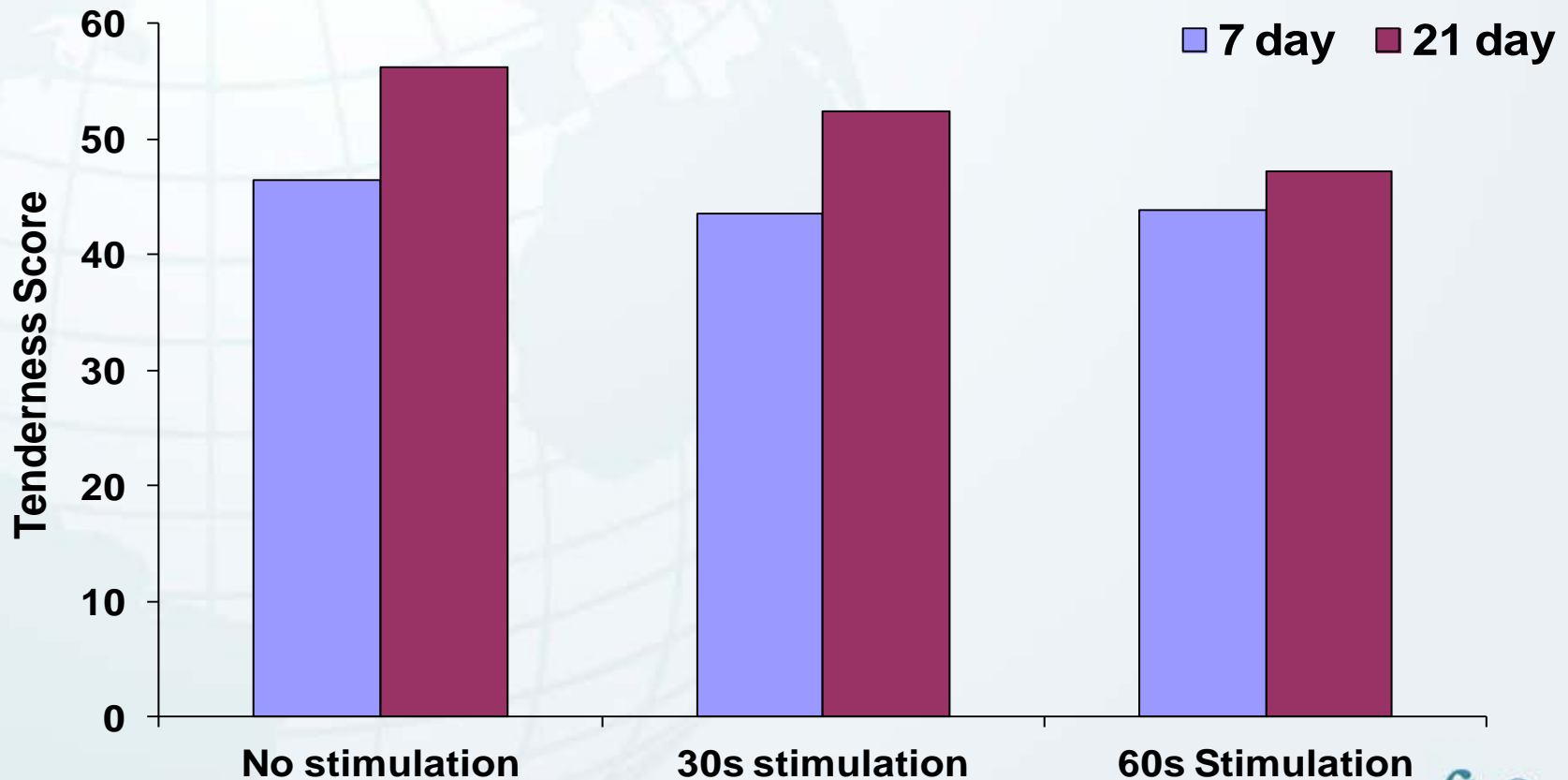
# The pH/temperature window

## A Key Critical Control Point



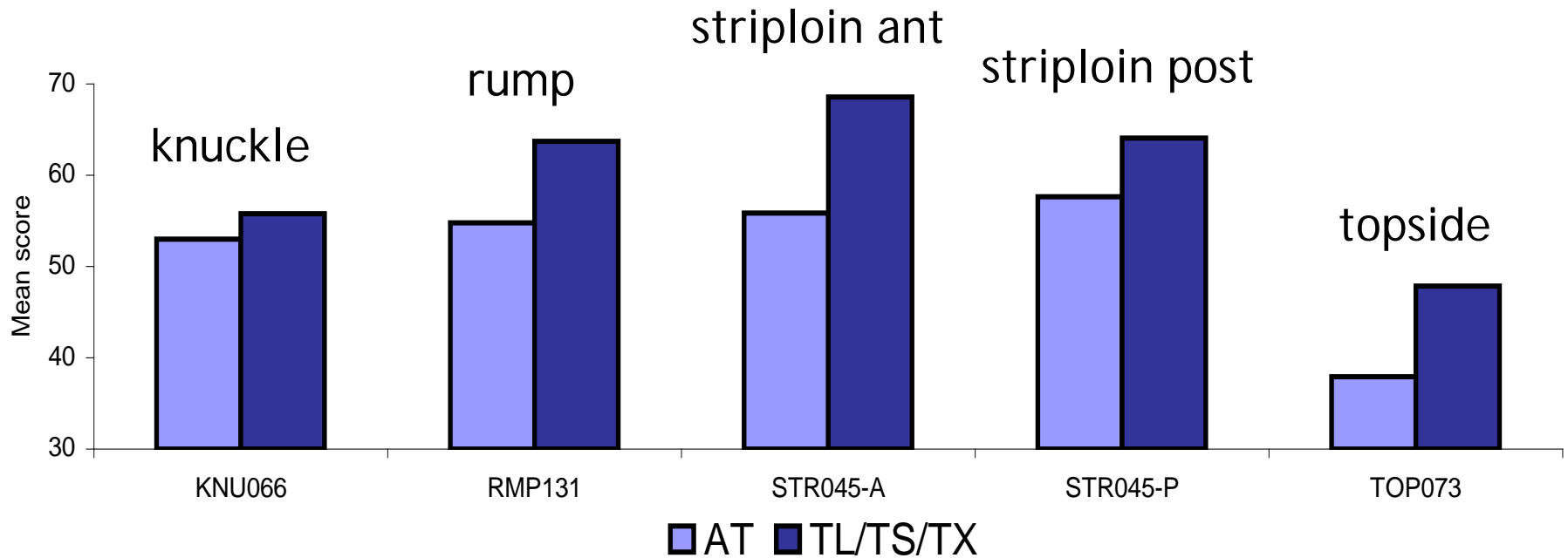
# AFBI research on key factors influencing beef eating quality

## Electrical stimulation x Ageing (7d & 21d)



# AFBI research on key factors influencing beef eating quality

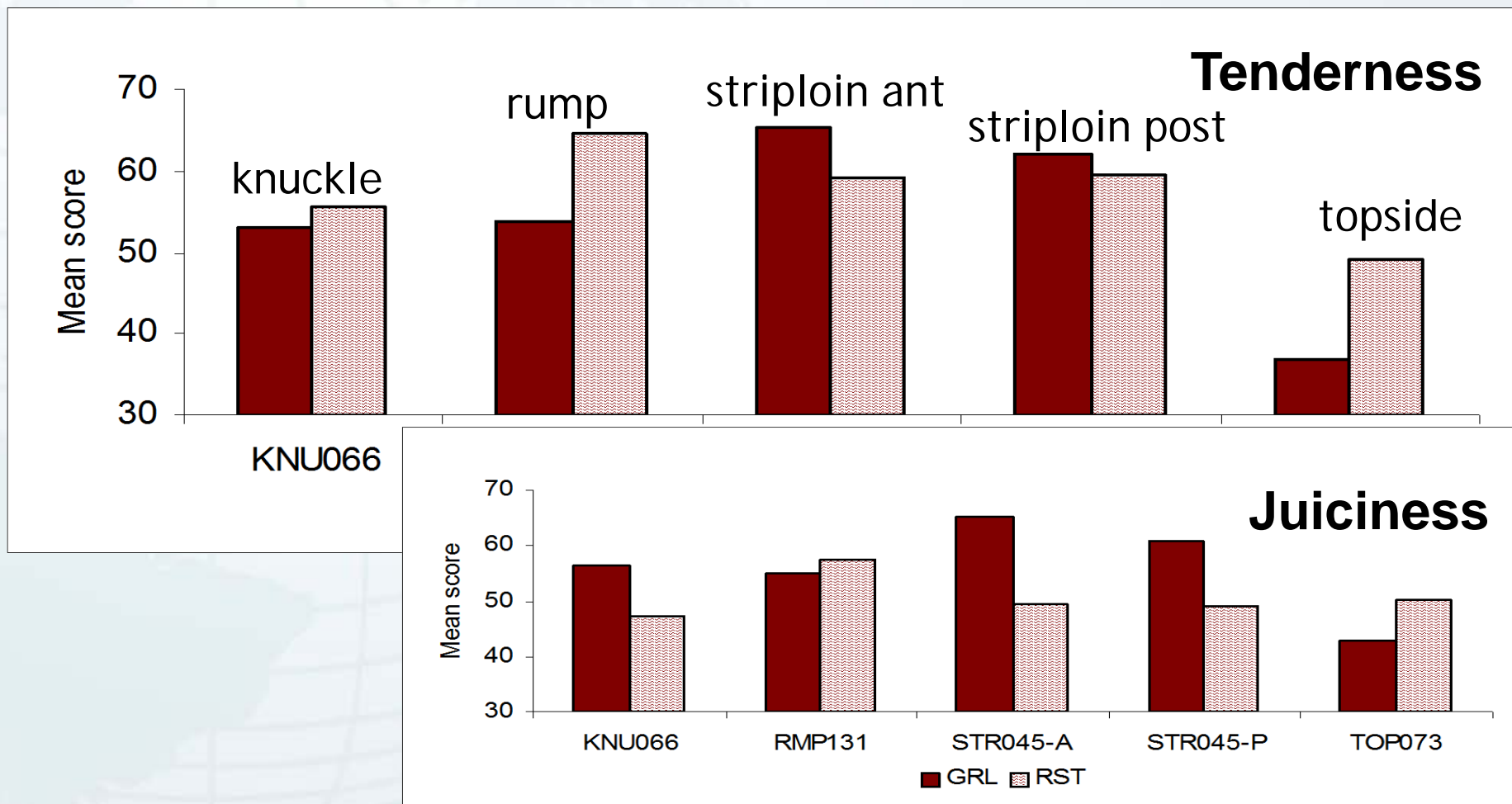
Cut/Muscle x Hanging (Achilles & Tenderstretch)





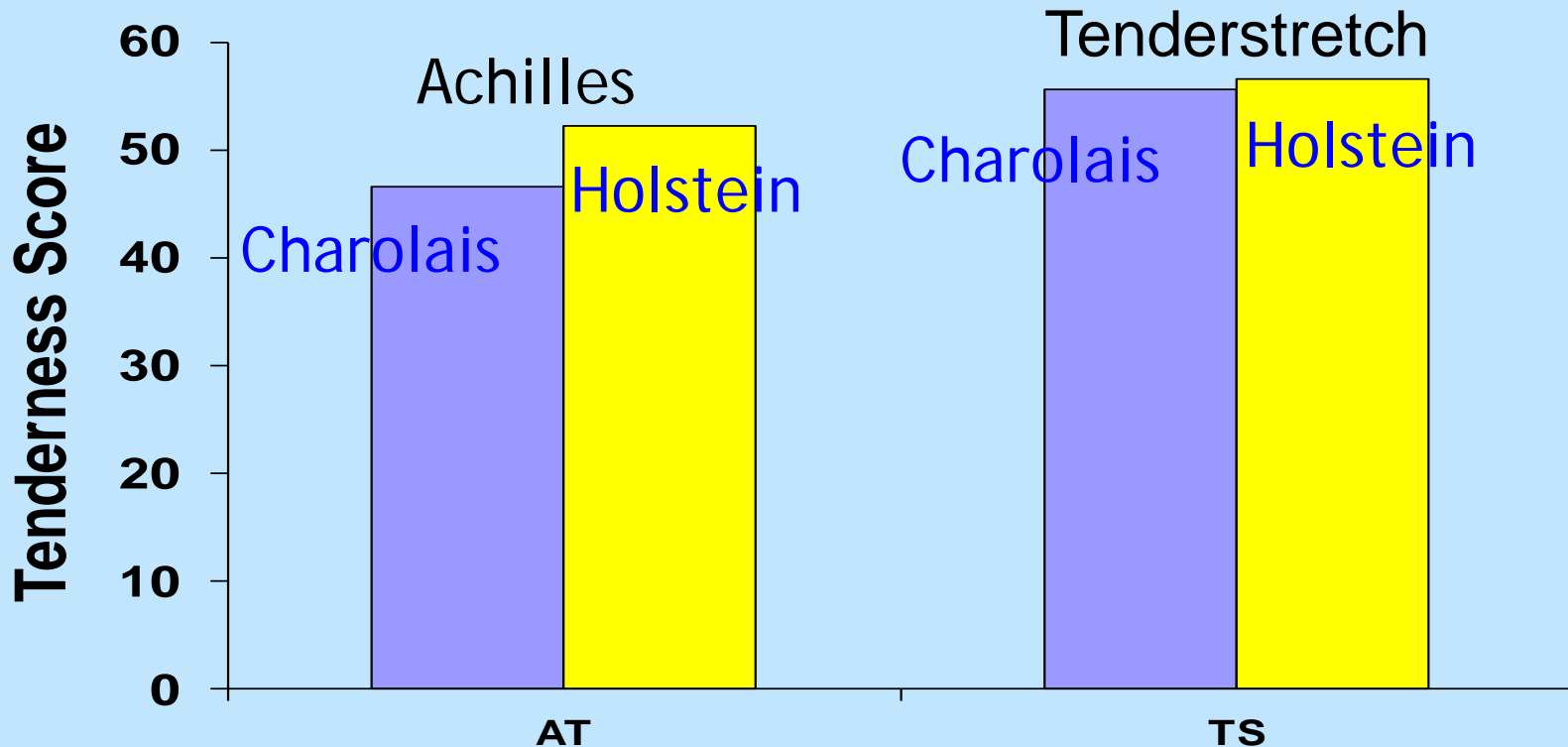
# AFBI research on key factors influencing beef eating quality

Cut/Muscle x Cooking method (**Grill** & Roast)



# AFBI research on key factors influencing beef eating quality

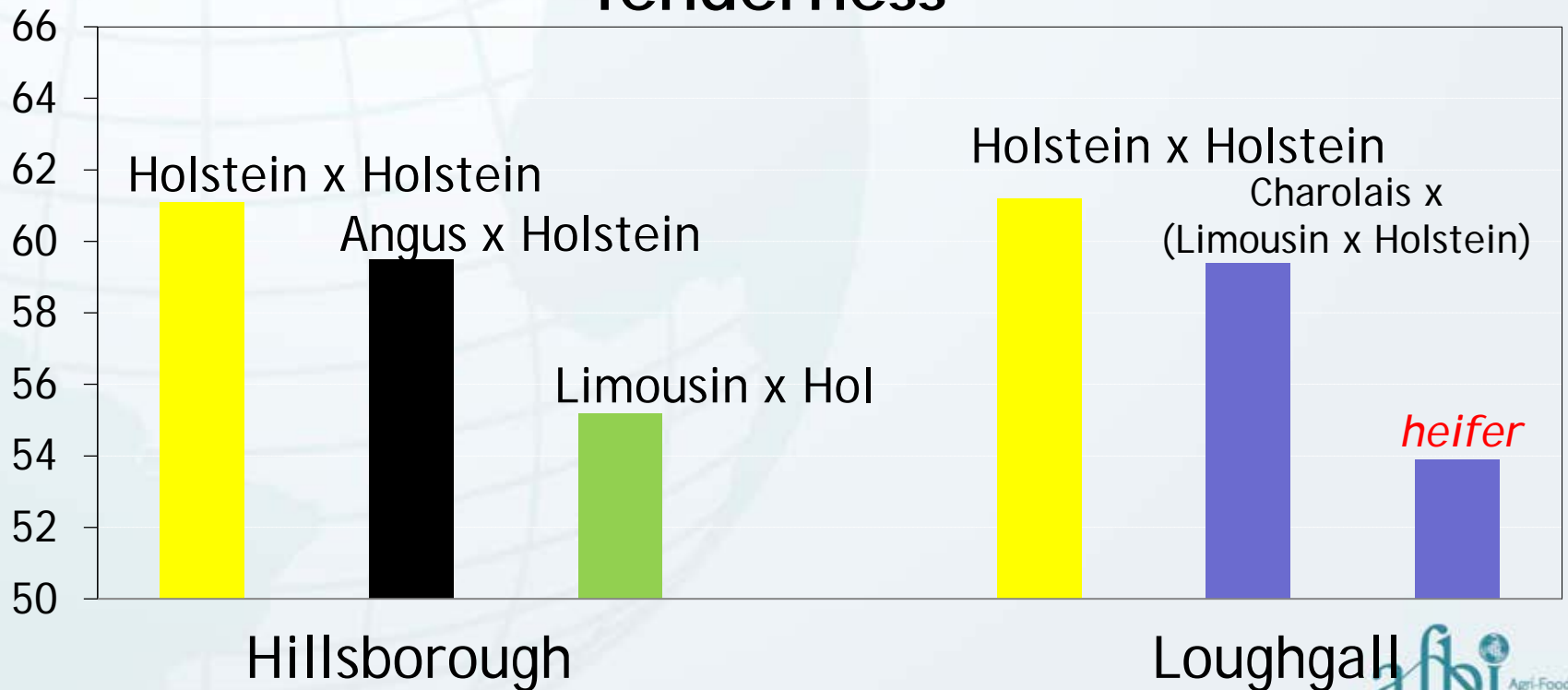
Beef / Dairy Breed x Hanging method



# AFBI research on key factors influencing beef eating quality

Quality Beef from Dairy and Dairy x Beef Breed Crosses (*DARD E&I Project + LMC*)

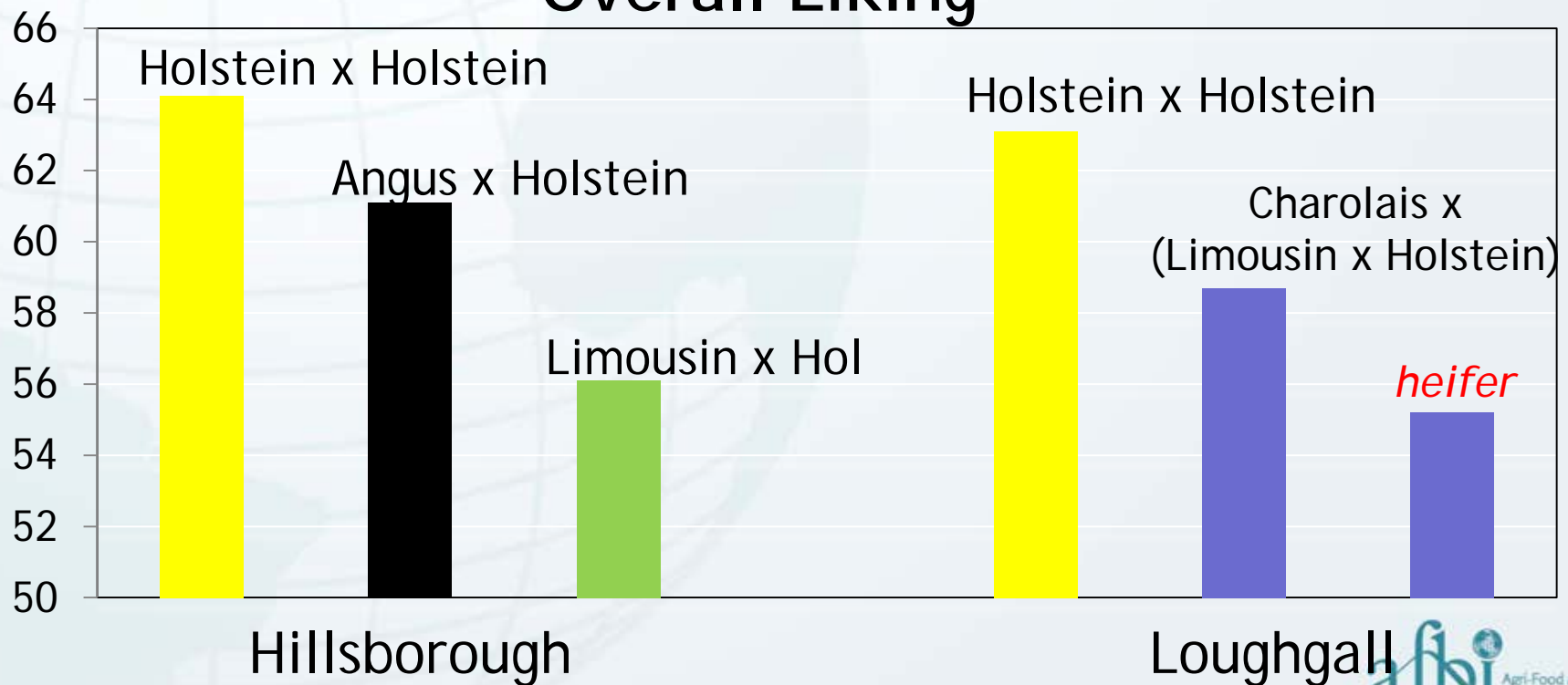
Tenderness \*



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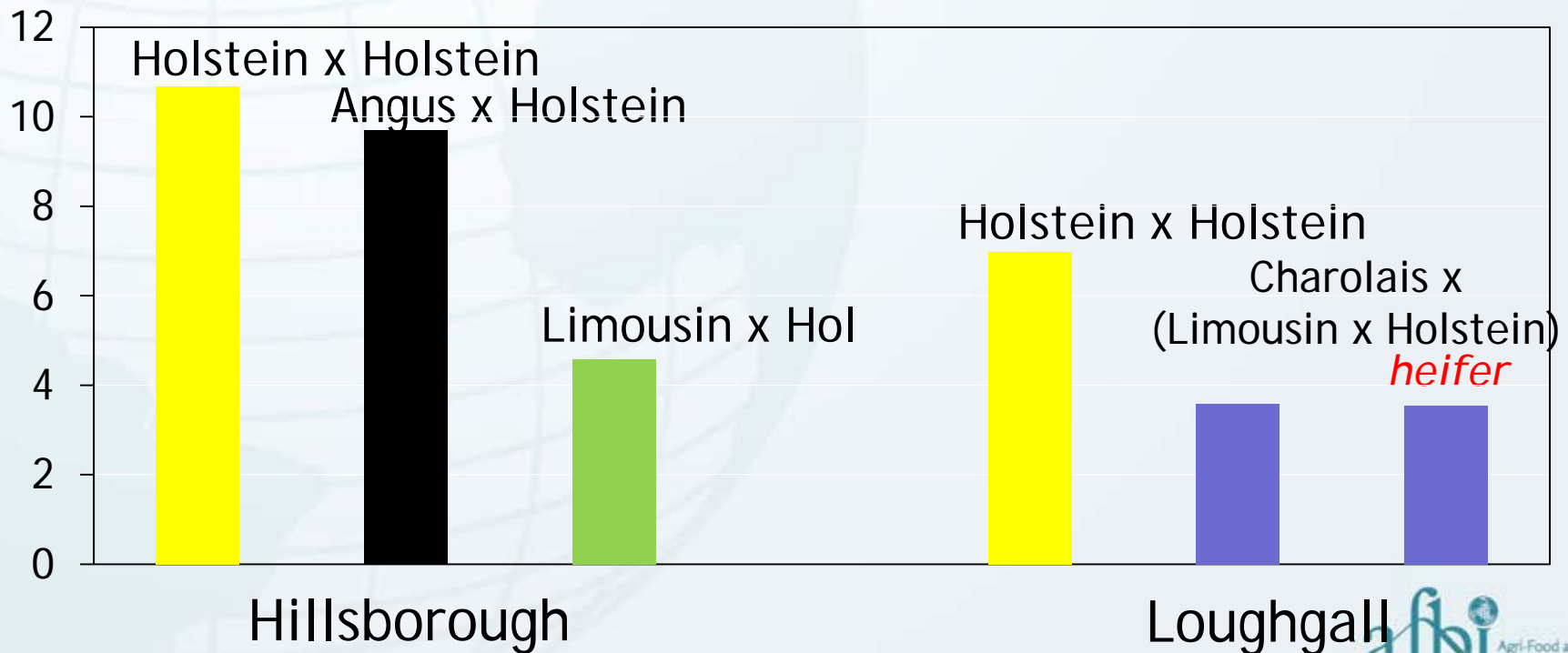
## Overall Liking \*\*\*



# AFBI research on key factors influencing beef eating quality

Quality Beef from Dairy and Dairy x Beef Breed Crosses (*DARD E&I Project + LMC*)

Intra Muscular Fat % \*\*\*



# AFBI research on key factors influencing beef eating quality

## Quality Beef from Dairy and Dairy x Beef Breed Crosses (*DARD E&I Project + LMC*)

Results corroborate previous research by AFBI showing consumer preference for dairy-bred beef

Holstein eating quality is as good as that from Angus cross and preferred to continental crosses due to...

- Higher levels of intramuscular fat

- Favourable rate of formation of beneficial flavour precursors (amino acids; sugars; nucleotide metabolites) during ageing

# Understanding eating quality through scientific analysis

## Understanding Consumer Likes and Dislikes (DARD E&I Project)

Consumer panels

+

Sensory profiling

+

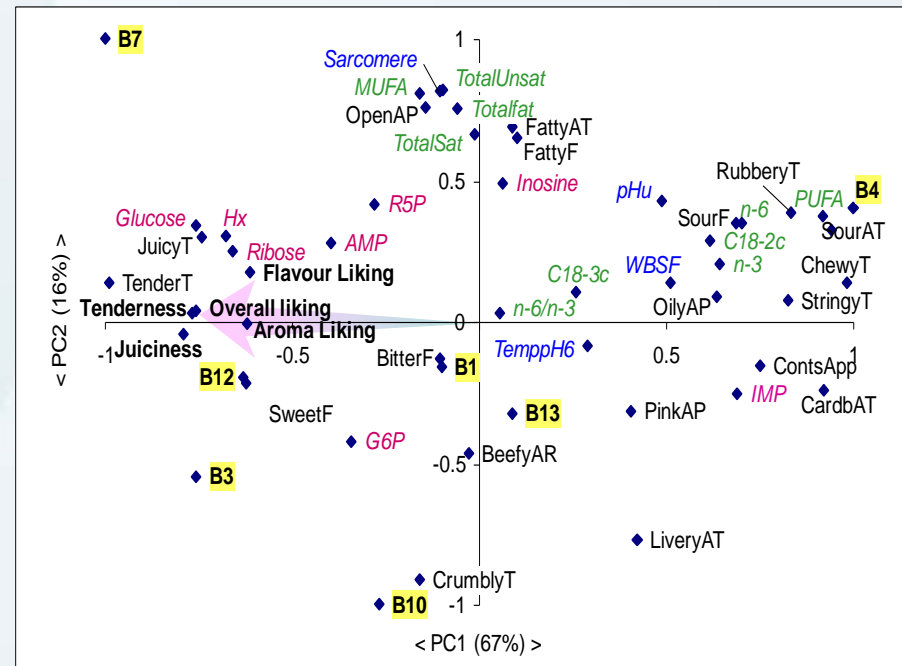
Instrumental analyses

+

Multivariate statistics

Associates analytical measurements with eating quality

Preference map for grilled beef





# Summary of AFBI's findings on key factors influencing NI beef eating quality

## Key factors:

- Cut or muscle
- Hanging method
  - Breed (marbling)
  - Cooking method
  - Electrical stimulation
  - Ageing

Research adopted  
by industry

## Less important factors:

- Stress / mixing / lairage
- Sex type
  - Conformation & fat class
  - Degree of doneness
  - Consumer nationality



# Conclusions

Our science has shown that eating quality of beef depends on:

- Good production systems that avoid pre-slaughter stress
- Appropriate adherence to good slaughter and chilling regimes to control rate of pH fall
- Appropriate packaging and chill storage

Genetic differences in eating quality are determined by:

- Factors that influence marbling
- Factors that influence rate of ageing

These scientific approaches can support 'Going for Growth' in developing markets for quality beef from our diverse production systems