Factors Affecting Eating Quality in Northern Irish Beef


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Meat Quality

- **Beef is judged and valued on eating quality**
  - Tenderness is a major factor with consumers
  - Flavour also important

- **Consistency of eating quality is crucial**
  - Maintain and expand markets

- **Scientific basis behind eating quality**
  - Many effects well known
  - Interaction of effects studied
# Meat Quality Effects Across the Supply Chain

**Pre-slaughter**
- Stress
- Maturity
- Growth
- Fatness
- Genetics
- Marbling

**Post-slaughter**
- pH Temperature
- Aging
- Carcase Hanging
- Chilling
- Cooking
N.Ireland Beef Production

- **Cattle types**
  - Young bulls, Dairy Breed

- **Production**
  - Small farms, Grass Fed

- **Pre-slaughter**
  - Short lairage and transport times

- **Consumer**
  - Likes beef well done
Eating Quality

Key areas investigated

1. Effect of Doneness, Cooking Method and Cut
2. Effect of Hanging Method and Ageing
3. Pre-slaughter Stress and Gender
4. Effect of Electrical Stimulation
5. Effect of Breed
6. Interactions of Eating Quality Factors
Materials and Methods

- 192 experimental animals
- 36,000 beef samples tasted
- Assessed by 6,000 consumers
- 2 Cooking Methods
- **Muscles taken from 5 major carcase primals**
  - Striploin, Rump, Knuckle, Silverside, Topside
Consumer Testing Program

Tenderness-40%
Juiciness-10%
Flavour-20%
Overall liking-30%

CMQ4
Meat Quality Score
Pre-Slaughter Stress and Sex Type

- Effect of pre-slaughter stress on the eating quality of bulls and steers
  - Lairage duration
  - Belly Clipping
  - Mixing
  - Fasting

- To compare the eating quality of bulls and steers
- To investigate the occurrence of high pH (Dark Cutting Beef)
### Effect of Lairage Time on the pHu of Bulls and Steers

Mean pHu was significantly higher (<0.05) for bulls than steers when held in overnight lairage.

<table>
<thead>
<tr>
<th>Sex type</th>
<th>Morning</th>
<th>Overnight</th>
<th>average</th>
</tr>
</thead>
</table>
| Bull     | 5.57    | *         | 5.77    | 5.67
|          | ns      |           | ns      |         |
| Steers   | 5.64    | ns        | 5.56    | 5.60
| average  | 5.61    | ns        | 5.67    |         |
Effect of Lairage Time and Clipping on the Eating Quality of Bulls and Steers

**Time in Lairage**

<table>
<thead>
<tr>
<th>Animal Clipping</th>
<th>Not Significant</th>
<th>AM</th>
<th>ON</th>
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<tbody>
<tr>
<td>TE</td>
<td>40</td>
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<td>JU</td>
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<td>CMQ4</td>
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**Animal Clipping**

<table>
<thead>
<tr>
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Effect of Sex Type on Eating Quality

Bulls vs Steers

No Significance

Consumer Score

<table>
<thead>
<tr>
<th></th>
<th>Tender</th>
<th>Juicy</th>
<th>Flavour</th>
<th>O.Liking</th>
<th>CMQ4</th>
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<tbody>
<tr>
<td>Bull</td>
<td>50</td>
<td>40</td>
<td>60</td>
<td>55</td>
<td>50</td>
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<tr>
<td>Steer</td>
<td>60</td>
<td>50</td>
<td>70</td>
<td>65</td>
<td>60</td>
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</tbody>
</table>

No Significance
Post Slaughter Carcase Processing
Effect of pH Temperature decline on Meat Quality

- pH
- Muscle temperature (°C)

- Ideal pH decline
- Cold shortening
- Heat shortening
Effect of Electrical inputs on pH Decline Striploin (normal chilling) AFBI Data
Eating Quality of Beef subjected to Electrical Stimulation

![Graph showing tenderness score for different stimulation times (No stimulation, 30s stimulation, 60s stimulation) and different aging periods (7 day, 21 day). The graph indicates a significant difference (P < 0.05) between the groups.]
Effect of Breed on Eating Quality

- Effect of genotype on eating quality
- Interaction with post slaughter processing (hang and ageing)
- 40 Steers
- 2 Genotypes
- Holstein (100%) and Charolais (>75%)
Effect of Breed on the Eating Quality of Grilled Striploin (CMQ4)

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<tr>
<th></th>
<th>Achilles</th>
<th>Tender Stretch</th>
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<tbody>
<tr>
<td></td>
<td>CH</td>
<td>HOL</td>
<td>CH</td>
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<tr>
<td>AGED</td>
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<td></td>
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<tr>
<td>7 day</td>
<td>48.86</td>
<td>*</td>
<td>56.85</td>
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<tr>
<td></td>
<td>ns</td>
<td>*</td>
<td>*</td>
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<tr>
<td>21 day</td>
<td>52.73</td>
<td>*</td>
<td>63.12</td>
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Factors affecting beef eating quality in NI

Impact on eating quality depends on **combined** impact of different factors = “Interactions”
Factors affecting beef eating quality in NI

Impact on eating quality depends on **combined** impact of different factors = “Interactions”
Conclusions

• The most important factors that affect the eating quality of N.I. Beef are:
  - Muscle, hanging method, dairy vs beef breed, position in muscle, cooking method, ageing, pH/T decline, pre-slaughter stress, marbling, animal age and carcase conformation/fat class

• Stress did not have a big effect in this experiment, but other research shows that it often does

• Overall impact on meat eating quality often depends on interactions occurring between these factors