Tenderstretch and ageing time are key parameters for premium beef

I. Legand¹, J.F. Hocquette², C. Denoyelle³, R. Polkinghorne⁴, P. Bru⁵

¹ Institut de l’Elevage, MRA, Boulevard des Arcades, 87060 Limoges Cedex 2, France
² Inra, VetAgro Sup, UMRH Theix, 63122 Saint-Genès Champanelle, France
³ Institut de l’Elevage, 149 rue de Bercy, 75595 Paris Cedex 12, France
⁴ Birkenwood Pty Ltd, 431 Timor Road, Murrundi, NSW 2338, Australia
⁵ C.V. Plainemaison Beauvallet, 18 Rue des abattoirs, 87000 Limoges, France
Background

- Tenderness is one of the most important components of beef eating quality.

- However, it often fails to satisfy consumers hence contributing to reduce beef meat consumption.

- Australia has developed the Meat Standards Australia (MSA) grading scheme to predict eating quality of beef.

- Through large-scale sensory testing by untrained consumers, MSA has identified animal and carcass factors that impact on consumer palatability.
Background

• Positive effects of tenderstretching and ageing on tenderness have been known for a long time.

• Therefore, these factors are included in the MSA grading scheme.

• Using the MSA approach, an experiment was conducted for the Beauvallet French company to quantify the effects of two hanging methods and two ageing times on beef eating quality.
Material and methods

• Nine Limousine cows of 3 to 10 years of age

• Carcass weights ranged from 400 to 455 kg.

• One side was suspended from the Achilles tendon (AT) and the other side was tenderstretched (TS) until 48h postmortem, before normal chilling.
Material and methods

- Four muscles (striploin, cub roll, eye of rump, topside) were cut and allocated to 10 or 20 days of ageing.

- Muscles were assessed as rare grilled steaks by 240 consumers according to the MSA protocol.

- Beef samples were first scored for tenderness, juiciness, flavor liking and overall liking and then assigned to one of the four MSA quality grades proposed.
The Meat Standards Australia System (principles)

MQ4 (global eating quality score) = 30% Tenderness + 10% Juiciness + 30% Flavour liking + 30% Overall liking
Consumers class meat as:

- Unsatisfactory
- Good every day
- Better than every day
- Premium

Global quality score

MQ4 -> 0 -> 46 -> 64 -> 76 -> 100
Results: consumer data

- Consumers (n=240) were 66.7% men
- Age distribution was fine
## Results: statistical analysis of consumer testing

<table>
<thead>
<tr>
<th>Covariates</th>
<th>Tenderness</th>
<th>Juiciness</th>
<th>Flavour liking</th>
<th>Overall liking</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testing session</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Consumer number</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Animal number</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Hanging method</td>
<td>***</td>
<td>*</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Ageing time</td>
<td>***</td>
<td>**</td>
<td>***</td>
<td>**</td>
<td>*</td>
</tr>
<tr>
<td>Muscle</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Carcass side</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Hanging method X Ageing time</td>
<td>NS</td>
<td>NS</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>
Results: quality improvement

Gain in %

Tenderstretched (TS) vs Achilles tendon (AT)
20 days of ageing vs 10 days of ageing

Tenderness
Flavour liking
Juiciness
Overall liking
Quality class
Results: quality improvement

Gain in %

- Tenderstretched (TS) vs Achilles tendon (AT)
- 20 days of ageing vs 10 days of ageing

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SP vs TA</th>
<th>20j vs 10j</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenderness</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Flavour liking</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Juiciness</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>Overall liking</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Quality class</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>
Results: additive effects for tenderness improvement

<table>
<thead>
<tr>
<th>Condition</th>
<th>Duration</th>
<th>Tenderness Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT + 10 days</td>
<td></td>
<td>+11</td>
</tr>
<tr>
<td>TS + 10 days</td>
<td></td>
<td>+14</td>
</tr>
<tr>
<td>AT + 20 days</td>
<td></td>
<td>+3</td>
</tr>
<tr>
<td>TS + 20 days</td>
<td></td>
<td>+8</td>
</tr>
</tbody>
</table>
Outputs: a new premium beef brand was launched

- Limousine cows
- Selection of four good cuts
- Marbling
- Tenderstreching
- Long ageing time (> 10 d)
- Grass-based livestock systems
Potential of grazed based systems

Biodiversity

Happy cows

Beautiful landscape

Natural feeding

Carbon sequestration

PUFA-rich meat

Photo credit ©: JF Hocquette
Conclusions

The MSA protocols were useful to check the major effects of tenderstretching and ageing time.

A new premium beef brand was launched.

Data of this experiment will be transferred to the “International Meat Research 3G Foundation” recently created to promote an international beef eating quality grading system under the auspices of UNECE.