Relationship of eating quality of different muscles

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DARD Project on Beef Eating Quality

- Approx. 50% useable meat → mince
- Maximise quality of all cuts, minimise variability of HQ cuts
### Cuts/muscles

<table>
<thead>
<tr>
<th>Topside</th>
<th>Fillet/tenderloin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semimembranosus</td>
<td>Psoas major</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Silverside</th>
<th>Striploin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps femoris</td>
<td>Longissimus dorsi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rump</th>
<th>Knuckle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gluteus medius</td>
<td>Rectus femoris</td>
</tr>
<tr>
<td>Biceps femoris</td>
<td></td>
</tr>
</tbody>
</table>
### Cuts and muscles studied

<table>
<thead>
<tr>
<th>Primal Cut</th>
<th>MSA code</th>
<th>Muscle Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fillet</td>
<td>TDR062</td>
<td><em>Psoas major</em></td>
</tr>
<tr>
<td>Striploin Anterior</td>
<td>STR045A</td>
<td><em>Longissimus dorsi Ant</em></td>
</tr>
<tr>
<td>- Mid</td>
<td>STR045M</td>
<td><em>Longissimus dorsi Mid</em></td>
</tr>
<tr>
<td>- Posterior</td>
<td>STR045P</td>
<td><em>Longissimus dorsi Post</em></td>
</tr>
<tr>
<td>Rump Cap</td>
<td>RMP005</td>
<td><em>Biceps femoris</em></td>
</tr>
<tr>
<td>- Heart</td>
<td>RMP131</td>
<td><em>Gluteus medius</em></td>
</tr>
<tr>
<td>- Heart (Eye)</td>
<td>RMP231</td>
<td><em>Gluteus medius</em></td>
</tr>
<tr>
<td>Topside</td>
<td>TOP001</td>
<td><em>Adductor femoris</em></td>
</tr>
<tr>
<td></td>
<td>TOP073</td>
<td><em>Semimembranosus</em></td>
</tr>
<tr>
<td>Knuckle</td>
<td>KNU066</td>
<td><em>Rectus femoris</em></td>
</tr>
<tr>
<td></td>
<td>KNU099</td>
<td><em>Vastus lateralis</em></td>
</tr>
<tr>
<td>Silverside Outer</td>
<td>OUT005</td>
<td><em>Biceps femoris</em></td>
</tr>
<tr>
<td>- Eye</td>
<td>EYE075</td>
<td><em>Semitendinosus</em></td>
</tr>
</tbody>
</table>
Experimental Protocol

- Meat Standards Australia (MSA) methods
- More than 6000 consumers
- 900 joints, 192 animals
- Grill panels
- Roast panels

• 36,000 tastings
Assessment of beef samples

Tenderness, juiciness, flavour liking and overall liking, e.g.,

- Not tender
- Extremely tender

• Satisfaction
  - Unsatisfactory
  - Satisfactory everyday quality
  - Better than everyday quality
  - Premium
RESULTS
Tenderness score for various cuts
Hanging method

Tenderstretching stretches some muscles on outside more than opposing muscles on inside.

Effect of hanging method depends on muscle.
Effect of hang x cut interaction on tenderness

Mean score

KNUCKLE | RUMP | STR - ANT | STR - POST | TOPSIDE
---|---|---|---|---
Achilles | Tenderstretch

30 40 50 60 70
Cut x Cook (GRL & RST)

Cooking method - significant effect on all traits except flavour liking

Striploin - higher scores when grilled than roasted

Rump and topside were better roasted
Correlation of tenderness

- Striploin tenderness often extrapolated to explain quality of whole carcase
- Is this valid?
Correlations between muscles:

When grilled or roasted

TS or AT
Correlation of tenderness for grilled steak cuts from tenderness score for striploin

<table>
<thead>
<tr>
<th>Cooking Method</th>
<th>Hanging method</th>
<th>Muscle 1</th>
<th>Muscle 2</th>
<th>Sig</th>
<th>% variance explained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grilled</td>
<td>AT</td>
<td>STRO45</td>
<td>RMP005</td>
<td>**</td>
<td>26.7</td>
</tr>
<tr>
<td></td>
<td>STRO45</td>
<td>RMP131</td>
<td>**</td>
<td></td>
<td>17.7</td>
</tr>
<tr>
<td></td>
<td>STRO45</td>
<td>RMP231</td>
<td>*</td>
<td></td>
<td>37.7</td>
</tr>
<tr>
<td></td>
<td>STRO45</td>
<td>TOP073</td>
<td>*</td>
<td></td>
<td>6.2</td>
</tr>
<tr>
<td>TS</td>
<td>STRO45</td>
<td>OUT005</td>
<td>ns</td>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>STRO45</td>
<td>RMP005</td>
<td>ns</td>
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<td>6.2</td>
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<tr>
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<td>STRO45</td>
<td>RMP131</td>
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<td>STRO45</td>
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<td>ns</td>
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<td>0.3</td>
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</tbody>
</table>

Striploin tenderness explains little of the variation in other muscles, especially when tenderstretch hung.
Correlation tenderness Rump cap vs. Striploin (GRILL, ACHILLES)

\[ y = 0.5478x + 24.259 \]

\[ R^2 = 0.2628 \]

P<0.01
Correlation tenderness Rump cap vs. Striploin (GRILL, TENDERSTRETCH)

\[ y = 0.0516x + 56.5 \]

\[ R^2 = 0.0038 \]
Correlation of tenderness for roasted beef cuts from tenderness score for striploin

<table>
<thead>
<tr>
<th>Cooking Method</th>
<th>Hanging method</th>
<th>Muscle 1</th>
<th>Muscle 2</th>
<th>Sig</th>
<th>% variance explained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roasted</td>
<td>AT</td>
<td>STRO45</td>
<td>KNU066</td>
<td>ns</td>
<td>0.1</td>
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<tr>
<td></td>
<td>STRO45</td>
<td></td>
<td>RMP231</td>
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<td>19.7</td>
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<tr>
<td></td>
<td>STRO45</td>
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<td>TOP073</td>
<td>**</td>
<td>16.8</td>
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<tr>
<td></td>
<td>TS</td>
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<td>OUT005</td>
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<td>STRO45</td>
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</table>

Striploin tenderness explains little of the variation in other muscles when roasted.
## Factors

<table>
<thead>
<tr>
<th>Cut or muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position within muscle</td>
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<tr>
<td>Hanging method</td>
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<td>Breed</td>
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<tr>
<td>Cooking method</td>
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<tr>
<td>Doneness</td>
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## Interactions
Conclusions

- Production and processing factors are interlinked in their effect on eating quality
- One muscle cannot be used to predict the eating quality of another muscle
  - Unless these factors are taken into account