Effect of cattle production practices on the incidence of dark cutting beef

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Dark cutting beef

Dark cutting?
Dark cutting beef

Glitches with dark cutting

Tenderness

Taste/Flavour

Shelf life
Dark cutting beef

Incidence and repercussions

<table>
<thead>
<tr>
<th>Year</th>
<th>Dark Cutting Frequency %</th>
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<tbody>
<tr>
<td>1989</td>
<td>0.80</td>
</tr>
<tr>
<td>1997</td>
<td>1.00</td>
</tr>
<tr>
<td>2000</td>
<td>1.00</td>
</tr>
<tr>
<td>2011</td>
<td>1.28</td>
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</tbody>
</table>

Price Discount

- $40/cwt or $340/head

Reducing dark cutting

- 1.2 to 0.8%
- Saves: $1.77 million

Report BCRC 2009-2013

Dark cutting beef

Potential Factors

Pre-slaughter stress
- Animal mixing
- Animal Handling
- Transportation
- Weather
- Estrus

Carcass/Abattoir
- Carcass weight
- Musculature
- Fat depth
- Chilling

Probably
- Growth promotants
- Production systems
- Muscle metabolism
- Nutrition
- Infection

Immonen et al., 2000; Jones & Tong, 1989; Kenny & Tarrant, 1988; Scanga et al., 1998; Kyla-Puhju et al., 2005
Objectives

- University of Alberta
- Dark cutting
- Melengestrol acetate
- Cattle gender
- Beta agonist
- Growth implants
- Pre-slaughter management
- Production system
- Weather
- Pre-slaughter management
Material and Methods

Data Collection

Two data-sets

I. Data set A (Single Farm)
II. Data set B (Farm X, Y and Z)

Information

• Cattle gender
• Production system (Calf-fed vs Yearling-fed)
• Melengestrol acetate (MGA)
• Hormonal growth promotants
• Beta agonist
• Feeding
• Carcass data
Material and Methods

Data-set A
(n=2058)

Calf-fed cattle
I. Heifers and Steers
II. Optaflexx® vs No Optaflexx®

Yearling-fed cattle
I. Heifers and Steers
II. Optaflexx® vs No-Optaflexx®

- Calf-fed received two implants (Ralgro® + Synovex Choice®).
- Yearling-fed received One implant (Synovex Choice®).
- 90 days gap between terminal implant and slaughter.
Material and Methods

Data-set B
\((n = 86408)\)

**Yearling-fed Heifers and Steers**

I. Pasture grazed or grass fed (GY)
II. Backgrounded yearling (BY)

**Calf-fed Heifers and Steers**

I. Winter calves (WC)
II. Fall calves (FC)

*Cattle Breeds*
- Red (predominantly Angus or Limousine)
- Black (predominantly black Angus)
- Red white-face (predominantly Hereford)
- White or tan to grey (Charolaise)
Material and Methods

Data-set B

Hormonal Growth Implants

Calf-fed Cattle

- Calves < 700 Lbs
  - Ralgro--1<sup>st</sup>
  - Component TE-100--2<sup>nd</sup> Implant
  - Component TE-200--3<sup>rd</sup> Implant

- Calves > 700 Lbs
  - Component TE-100--1<sup>st</sup> Implant
  - Component TE-200--2<sup>nd</sup> Implant

Yearling-fed Cattle

- Cattle < 1000 Lbs
  - Component TE-100--1<sup>st</sup> Implant
  - Component TE-200—2<sup>nd</sup> Implant

- Cattle > 1000 Lbs
  - Component TE-200--1<sup>st</sup> Implant

Steers: Optaflexx<sup>TM</sup> for 28-30 days

Heifers: MGA until 2 days before shipment
Material and Methods

Data-set B

Slaughter seasons

- Winter (mostly below 0°C and as low as -20°C)
  - December
  - January
  - February
- Spring (above 0°C)
  - March
  - April
- Summer (9°C to 20°C)
  - May to September
- Fall (-17°C to +14°C)
  - October
  - November
Material and Methods

Statistical Analyses

- Separate analyses for data-set A and B.
- Used statistical analysis system (SAS, Version 9.3).
- Catmod procedure and logistic regression to estimate the likelihood of dark cutting.
- General Linear Models procedure for the analysis of variance.
Results

Data-set A
(n=2058)
Overall dark-cutting: 2.23%
Results

Data-set A

- Calf-fed and yearling-fed heifers were at greater risk of cutting dark.
- Steers were less likely to cut dark regardless of the production system.
Results

Data-set A

- Production system (Calf vs Yearling) interacted with Optaflexx® treatment (Optaflexx® vs No Optaflexx®).
- Yearling cattle received no Optaflexx® had increased frequency of Prime and AAA carcasses.
- No effect on the likelihood of grading Canada B4 (dark-cutting).
Results

Data-set B

Overall dark-cutting: 0.85%

- Interaction of gender with implant nested within production system (Calf-fed vs Yearling-fed).
- No clear trend for implant effect.
Results

Data-set B

Effect of production system and gender

Increased frequency of dark cutting in WC, FC and BY heifers.

Grass-fed (GY) heifers and steers had reduced frequency of dark cutting.
Results

Data-set B

- Backgrounded-yearling (BY)
- Grass-fed yearling (GY)
- Fall calves (FC)
- Winter calves (WC)

Production system was confounded with slaughter season/months.
Analysis incorporating season, gender and four production systems was redundant.
Results

- Three-way interaction of gender, production system (GY and BY) and season.
- Slaughter season influenced the likelihood of dark cutting.
- Trend of production system effect remained as in the analysis with gender and production system alone.

Backgrounded yearling (BY) and grass-fed (GY) yearling cattle were slaughtered in all four seasons.
Results

Analysis of Variance

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Fall calved steers</th>
<th></th>
<th>Winter calved steers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>AA</td>
<td>AAA</td>
<td>Prime</td>
</tr>
<tr>
<td>n</td>
<td>292</td>
<td>8023</td>
<td>9144</td>
<td>73</td>
</tr>
<tr>
<td>Start weight (kg)</td>
<td>297&lt;sup&gt;e&lt;/sup&gt; (3.02)</td>
<td>298&lt;sup&gt;e&lt;/sup&gt; (0.57)</td>
<td>291&lt;sup&gt;f&lt;/sup&gt; (0.54)</td>
<td>282&lt;sup&gt;f&lt;/sup&gt; (6.03)</td>
</tr>
<tr>
<td>Days to finish</td>
<td>222&lt;sup&gt;d&lt;/sup&gt; (1.52)</td>
<td>227&lt;sup&gt;c&lt;/sup&gt; (0.29)</td>
<td>235&lt;sup&gt;b&lt;/sup&gt; (0.27)</td>
<td>246&lt;sup&gt;a&lt;/sup&gt; (3.04)</td>
</tr>
<tr>
<td>Carcass weight (kg)</td>
<td>388&lt;sup&gt;e&lt;/sup&gt; (1.59)</td>
<td>397&lt;sup&gt;b&lt;/sup&gt; (0.3)</td>
<td>400&lt;sup&gt;a&lt;/sup&gt; (0.28)</td>
<td>402&lt;sup&gt;a&lt;/sup&gt; (3.19)</td>
</tr>
<tr>
<td>Grade rib eye area (cm²)</td>
<td>104&lt;sup&gt;a&lt;/sup&gt; (0.65)</td>
<td>97.4&lt;sup&gt;b&lt;/sup&gt; (0.12)</td>
<td>90.9&lt;sup&gt;d&lt;/sup&gt; (0.11)</td>
<td>84.2&lt;sup&gt;g&lt;/sup&gt; (1.29)</td>
</tr>
</tbody>
</table>

- Dark cutting steers were as heavy as most normal grades at the start of finishing.
- Dark cutting steers either finished in the same mean days or greater than normal grades.
- Mean carcass weight for B4 steers was lower than rest of the grades except Canada A which had gREA greater than all the other grades.
Results

- Results for fall-calved heifers were same as that for fall-calved and winter-calved steers.
- Increased dark cutting in heifers and steers may be due to reduced carcass weight.
- Increased carcass weight itself may not be responsible for reduced dark cutting but may represent increased growth rate because:
  - Fast growing cattle may have less response to stress.
  - May have adequate muscle glycogen.
  - May differ in utilization of muscle glycogen.

*(Smith et al., 1999)*
Conclusions

- Increased lairage/frequent shipping increased the likelihood of dark cutting.
- Heifers especially the calf-fed are more prone to cut dark than steers.
- Slow growing cattle are at greatest risk of cutting dark.
- Lack of implant effect was likely because there was adequate gap between terminal implant and slaughter.
Acknowledgment

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Dr. Heather Bruce

Agriculture and Agri-Food Canada
Thank You!