Detection of Bruising in Holstein Slaughter Cows with Infrared Thermography

Ashlynn Kirk
Kurt D. Vogel, PhD.
University of Wisconsin - River Falls

Introduction
Methods
Results
Discussion
Project Overview

[Image of a cow]
Holstein Cull Cows

"dairy cows removed from the breeding herd, or "culled," and entering the beef supply chain"
(Vogel et al., 2018)

36 cows included in study
Meat Processing Terminology

Bruising:
Tissue damage with rupture of the vascular supply and accumulation of blood and serum
(Hoffman et al., 1998)

Carcass Rail-Out:
When a carcass is removed from the primary slaughter process so more trimming can be preformed
Equipment

FLIR E8 Thermal Imaging Camera
FLIR Tools image viewing software

Thermography: Process of capturing heat emission data in an image

Scale to weigh trim

https://www.flir.com/products/e8/
In Theory...

- Surrounding tissues will become inflamed
- Bruising
- Thermography detects areas of heat emission
- Trim Losses
Data Collection
How cows selected

Analysis
Procedure
Images
Procedure

Image collected of live cow

↓

Image collected after hide is removed from carcass

↓

If carcass receives a rail-out status...
Additional trim is collected, weighed, and more images collected
Example Data Set 1
Example Data Set 3
SAS Enterprise Guide 7.1 environment

Analyses conducted on trim loss data:
Student’s T-tests with Tukey’s Test adjustments specified within the model.

Differences were considered significant when \( \alpha \) was less than or equal to 0.05
Impact of rail-out status on trim loss from cull dairy cows (N = 36)

Graph showing trim loss (kg) for cull dairy cows:
- Yes: 16.2 kg
- No: 0 kg

Table showing comparison of trim loss:

<table>
<thead>
<tr>
<th>Railed out</th>
<th>Trim loss (kg)</th>
<th>SE</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES (n = 15)</td>
<td>16.2</td>
<td>2.0</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>NO (n = 21)</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
Impact of thermal inflammation bruise detection status on trim loss from cull dairy cows (N = 11)

<table>
<thead>
<tr>
<th>Detected</th>
<th>Trim loss (kg)</th>
<th>SE</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES (n = 7)</td>
<td>21.0</td>
<td>4.9</td>
<td>0.3200</td>
</tr>
<tr>
<td>NO (n = 4)</td>
<td>17.6</td>
<td>6.4</td>
<td></td>
</tr>
</tbody>
</table>
Relationship of inflammation detection and rail-out status from cull dairy cows (N=11)
Implications

Initial step in assessing if infrared thermal imaging technology could be utilized as a method to detect bruising and predict rail-out status.

Additional research necessary to determine precision and accuracy.

If successful, potentially add value to cows at livestock markets by indicating cows that are less likely to have major bruising.

Potential to be a beneficial tool.

Contact Information:
Ashlynn Kirk
ashlynn.kirk@my.uwrf.edu
Works Cited


Thank You