Salmonella Heidelberg: An on-farm study of dairy operations
Investigation Plan

• Design a case-control study from WI Veterinary Diagnostic Laboratory submissions
  – ~16 case farms, ~32 control farms (2 controls/case)
    Case – Heidelberg isolated from dead calves
    Control – Heidelberg not isolated from the calf or operation

• Collect samples for *Salmonella* isolation
Investigation Plan

• Design a case-control study from WI Veterinary Diagnostic Laboratory submissions
  – ~16 case farms, ~32 control farms (2 controls/case)
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  – Collect samples for *Salmonella* isolation

• Key questions:
  – What are the sources of *S. Heidelberg*?
  – What practices are involved in the spread of *S. Heidelberg*?
  – What practices can be implemented to control *S. Heidelberg*?
Case – Control Study Focus Areas

- Herd Inventory and Demographics
- Herd Additions and Biosecurity*
- Calf Sales, Movement, and Health
- Calving, Colostrum, and Preweaned Calf Management
- Cattle Health
- Feeding and Preventive Practices
- Housing
- Human Illness
- Case and Control Calf Information
Current Activities

• Evaluating the case-control study
  – Herd Additions and Biosecurity
  – Fishers Exact test in SAS
    • $P$ value $< 0.1$
Current Activities

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  - Herd Additions and Biosecurity
- Fishers Exact test in SAS
  - $P$ value $< 0.1$
- Targeted sampling areas likely to yield *S. Heidelberg*
  - Screened for *S. Dublin*
Current Activities

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• Targeted sampling areas likely to yield S. Heidelberg
  – Screened for S. Dublin

• Samples tested at NVSL and WVDL
  – Hygiena InSite test
  – Boot cover swabs
  – Swiffer
Preliminary Results

- 23 farms completed the survey
  - 12 cases
  - 11 controls

- 21 farms had samples collected and tested
  - 11 cases
  - 10 controls
Preliminary Results

• Herd Inventory and Demographics

<table>
<thead>
<tr>
<th>Herd Size</th>
<th>Case</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small (1-99 head)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium (100-499)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large (500+)</td>
<td></td>
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</tr>
</tbody>
</table>

$P\ value = 0.67$
Preliminary Results

• Herd Additions and Biosecurity
  – Herd additions

\[ P \text{ value} = 0.09 \]
Preliminary Results

• Herd Additions and Biosecurity
  – Herd additions as a percentage of calf inventory

\[ P \text{ value} = 0.01 \]
Preliminary Results

• Herd Additions and Biosecurity
  – Source of additions

\[ P \text{ value } = 0.28 \]
Preliminary Results

• Herd Additions and Biosecurity
  – Source of additions

\[ P \text{ value } = 0.01 \]
Preliminary Results

• Herd Additions and Biosecurity
  – Source of additions

P value = 0.07
Preliminary Results

- Herd Additions and Biosecurity
  - Cleaning of calf transport vehicles to the operation

![Bar chart showing frequency of cleaning practices after each shipment, after 2-3 shipments, and as needed/unknown. The chart includes cases and controls, with a P value < 0.01.]
Preliminary Results

- **Herd Additions and Biosecurity**
  - Disinfection of calf transport vehicles after cleaning

![Bar chart showing the frequency of disinfection practices among cases and controls.](chart.png)

*P value* < 0.01
Preliminary Results

• Herd Additions and Biosecurity
  – Distance calves transported

\[ P \text{ value} = 0.05 \]
Preliminary Results

- Herd Additions and Biosecurity
  - Calf housing cleaned with water/steam

\[ P \text{ value} = 0.07 \]
Preliminary Culture Results

- 200 samples cultured
- *Salmonella* Heidelberg
  - 46 of 200 = 23%
- Any *Salmonella*
  - 98 of 200 = 49%

- Case farms
  - No *S. Heidelberg* was found on 2 of the 11 farms

- Control farms
  - No *Salmonella* found on 2 of 10 farms
Percent of Samples Positive for S. Heidelberg
Percent of Samples Positive for S. Heidelberg or any *Salmonella*
Preliminary Results

- **Source of calves**
  - Dealer/market

- **Proportion purchased**
  - >100% of current herd size

- **Distance traveled**
  - >50 miles

- **Cleaning equipment / housing**
  - Higher for case farms

- **Frequently found in calf areas**

- **Booties**
  - Detected Heidelberg if present in any other sample

- **Workers are likely spreading the disease on the operation**