HEALTH AND BEHAVIOR: IMPACT ON STOCKER AND FEEDLOT

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Bovine Respiratory Disease

**Stressors**
- Castration
- Weaning
- Commingling
- Ration Change
- Transport
- Dehydration

**Pathogen Infection / Proliferation**
- IBR, BVD, PI3, BRSV
- MH, PM, MB, HS
- Others?

**Environmental Challenge**
- Commingling
- Sick calf shedders
- Weather

**Decreased pulmonary immune defenses / Pathogen proliferation**

**Bronchopneumonia (BRD)**
Economic and performance consequences associated with the number of treatments for initial individual cases of bovine respiratory disease in commercial feeder cattle

Objective:
- Estimate cost of treating individual calf:
  - Never (0X)
  - Once (1X)
  - Twice (2X)
  - Three or more times (3 or > X)

N. Cernicchiaro, B. White, D. Renter, A. Babcock

Data Analysis

- Individual calf performance, health, carcass data
- 212,867 hd
- 2001-2006

Economic models:
- Standardized markets, feed costs (10 yr averages)
- Comparisons based on differences in performance
- Calculated net returns for each calf
Net Returns by # Tx (fall only)

- 0X: $39.41
- 1X: $29.49
- 2X: $16.56
- 3X+: $(33.00)

Number of times treated
BRD: Data based evaluation

1. Refined classification of BRD events
   a) Individual animal diagnosis
   b) Pen-Level Events: Magnitude and Temporal

2. Managing BRD
BRD in individuals

- Find the sick calf
  - Clinical diagnosis

- Disease progression
Disease Detection Thresholds

*Outcome depends when intervene!*

- **Intervention Points**
- **Severe Clinical Signs**
- **Mild Signs**
- **No Clinical Signs / Minor performance loss**

Point of No Return?

Time

Tissue Damage
Subclinical Disease: Iceberg Effect

- Wittum, JAVMA 1996
  - Survey 469 steers: birth to harvest
  - 35% treated for BRD (78% had lung lesions)
  - 65% not treated for BRD (68% had lung lesions)

- Schneider et al, JAS 2009
  - 1,665 calves: BRD Morb = 8.2%, Lung lesions = 62%

- Reinhardt et al, JAS 2009
  - 21,528 calves with individual performance data
  - Morbidity & lung lesions negatively associated with initial BW, ADG, HCW
  - Avg 0.12 treatments per calf w/ lung lesions (n=269)
  - Avg 0.07 treatments per calf w/out lung lesions (n=6557)
Serial progression of induced Mannheimia haemolytica pneumonia

**Objective:**
To perform serial evaluations to quantify changes in behavior, physiologic, and pathologic parameters related to disease progression in experimentally induced Mannheimia haemolytica pneumonia calves.

Hanzlicek et al, 2010 AJVR
Conclusions

- **BRD Induction Model**
  - Rapid disease progression; all calves displayed clinical signs
  - Clinical signs and lung lesions similar in appearance to field BRD cases (smaller lesions than fatal field cases)

- **Diagnostic Parameters:**
  - Measured parameters failed to predict level of lung lesions
  - Behavior and clinical scores useful
Effect of Mannheimia haemolytica pneumonia on behavior and physiologic responses of calves experiencing hyperthermal environmental conditions.

Objectives:
• Determine effects of inducing BRD (Mannheimia) in high ambient temperatures
  • Body temperature
  • Behavior
  • Inflammatory profile


**Mannheimia** challenge

- Conducted during high ambient temperatures (July)
- 18 heifers randomly assigned to either Mannheimia haemolytica (n=10) or Control (n=8) group
- Calves were group housed for 10 days after challenged
- Directed endoscopic challenge: accessory bronchus
% of MH calves sick (CIS 2) by Trial Day

Note: a CON calf classified CIS=2 on d 5 PM/6 AM (n=2)
Rectal temperature: first 24 hours

* $P$ value $< 0.05$
Rectal temperature by trial day

* $P$ value $< 0.05$
Percent time calves spent lying down

![Graph showing the percentage of time calves spent lying down across different trial days. The graph compares two groups: Control and Mannheimia. Asterisks indicate significant differences at P value < 0.05.](Image)

* P value < 0.05
% Time spent within 1 foot of grain bunk

- Model adjusted percentage of time calves spent within 1 foot of grain bunk
- Trial Day
- Control and Mannheimia lines with error bars
- * P value < 0.05
Summary

- Rectal temperatures in MH calves extremely high early
- Few clinical signs of BRD; lung lesions mild
- MH calves spent more time lying down, less time at grain
- MH calves had an initial shrink in body weight
Behavior following *Mycoplasma bovis* challenge in calves


2012 AJVR
Research sponsored by CEVA Biomune
Behavioral Observations

• Calves equipped with a Ubisense ear tag to monitor behavior and activity during the trial

• Monitored to see if activity level is an indicator of illness

• Looked at calves proximity to water, feed, and shed
Clinical illness scores
Comparison to Clinical Illness Scores

![Bar graph comparing Clinical Illness Scores for Hyper I and Waterper I.](image)
Distance traveled and lung score

Significant interaction: LS by trial day
Diagnostic Accuracy of BRD Event Identification

- No perfect method to defining “cases”
- **Low specificity** -> treat unnecessarily
- **Low sensitivity** -> miss cases; resulting performance low
- *Prevention key to limiting losses*
BRD: Data based evaluation

1. Refined classification of BRD events
   a) Individual animal diagnosis
   b) Pen-Level Events: Magnitude and Temporal

2. Managing BRD
Pen-level BRD Events

- Magnitude influences interventions
- Performance impact influences interventions

Irsik et al. 2006 Bovine Practitioner
- Feed conversion: Increase 0.27 lb for each % death loss
- Average Daily Gain: Decrease 0.08 lb for each % death loss
- Added costs: Increase $1/hd for each % death loss
- Mortality: Estimate by multiplying percent treated by 0.14
Lot Level Risk factors

- Transportation characteristics
  - Distance traveled: entire period BRD morbidity / mortality
  - Shrink: increased BRD incidence / performance losses

- Weather conditions influence BRD risk
  - Max wind speed, mean wind chill, temperature change
    - Cernicchiaro et al J ANIM SCI 2012, 90:1328-1337
Lot-level cumulative morbidity risk

- Lots with between 30 and 500 hd
- 23 feedyards
- Between 2003 and 2008
- n = 45,656
Lot-level cumulative morbidity risk

Median Risk: 5.1%
Mean Risk: 9.5%
3rd Quartile Risk: 12.6%
Population Dynamics

- Morbidity evaluation by lot

![Histogram showing the percentage of total pulls for different DOF values. The x-axis represents DOF values from 1 to 46, and the y-axis represents the percentage of total pulls from 0% to 14%. The graph shows a peak at DOF 10, with decreasing values as DOF increases.]
Population Diagnosis

- Example data:
  - 40% morbidity
  - Calves, 1st 45 DOF

- Differences by:
  - Population
  - Etiologic Agent
Summary

- Individual BRD Events
  - Costly
  - Challenging to accurately diagnose
  - Prevention important

- Lot-level BRD events
  - Economically important
  - Known, preventable risk factors