Systemic necropsy and mortality evaluation

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BCI Funding disclosure

- Foundation for Food and Agricultural Research
- USDA National Institute for Food and Agriculture
- USDA Higher Education Challenge Grants
- USDA Veterinary Services Grant Program
- National Science Foundation
- KS Beef Council
- KS Dept. of Agriculture
- National Cattlemen's Beef Association
- American Angus Association
- American Association of Bovine Practitioners
- Alberta Veterinary Labs
- Elanco
- Boehringer-Ingleheim

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Systemic Necropsy

Feedyard Results

Calf Ranch Results

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Systemic Necropsy

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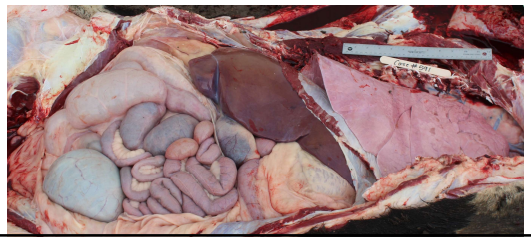
Systemic Necropsy

- Systemic necropsies provide a more accurate estimate of disease frequencies
- Standard method to insure analysis of all body systems



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Liver

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Heart

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Lung

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Lung Cut

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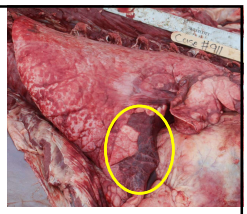
Systemic necropsy

- Case 911
- Right Side: Acute BP



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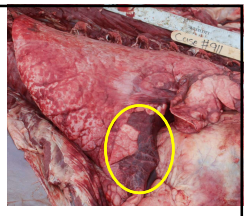
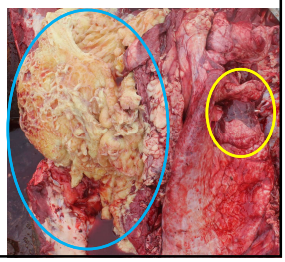
Systemic necropsy

- Case 911
- Right Side: Acute BP
- Left Side: Severe Pleuritis + BP





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Systemic necropsy

- Recording data all organs
- Digital pictures
- Samples (histopath / fresh tissue)
- Diagnoses confirmed by veterinarian

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Systemic Necropsy

Feedyard Results

Calf Ranch Results

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Feedyard necropsies

- Cross sectional observational study
- 6 Kansas Feedyards
- June-July 2022 (n=417)
- June-July 2023 (n=517)

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Cattle Demographics

- 2/3 heifers (matching yards arrival profile)
- > 90% native (beef breed) cattle
- > 70% arrival weight between 600-900 lbs

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Concurrent Diseases

Objective: Determine the frequency of multiple lesions and organ systems effected in feedlot mortalities and the most common combined concurrent lesions with their affected organ systems.

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Concurrent Diseases

Lesion Category	System
AIP, BP, BIP, Other Pulmonary	Pulmonary
Bloat, Liver Abscess, GI	Gastrointestinal
CHF, Heat Stress, Other Cardiovascular	Cardiovascular
Other	Other

> 85% of cases had 2 or more concurrent lesions

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Concurrent diseases

Most common concurrent lesions

- BIP/GI (n=44)
- BRD/GI (n=24)
- BIP/GI/CHF (n=21)
- BRD/GI/CHF (n=12)
- AIP/GI (n=12)
- BIP/CHF (n=12)

Most common concurrent systems

- GI/Pulmonary (n=121)
- Cardio/GI/Pulmonary (n=93)
- Cardio/Pulmonary (n=40)
- GI/Other/Pulmonary (n=25)
- Other/Pulmonary (n=16)
- Cardio/GI (n=15)

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Liver Abscesses

Objective: Evaluate liver abscess frequency during the feeding period and its association with cattle demographics

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Liver Abscesses

- 26/396 necropsies had liver abscesses (6.6%)
- No correlation with gross GI lesions
- Further evaluation with histopathological GI lesions

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Heart Lesions

Objective: Determine the association between heart lesions and heart measurements from photos taken during necropsy

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Heart Lesions

- *Heart Lesions:* any heart abnormality
- *Heart disease:* congestive heart failure with adjunct signs

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Case 014

- DOF: 171
- Treated 1 time for AIP
- Projected ship: 6/18
- Death date: 6/06

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Heart Lesions

- *Heart Lesions:* any heart abnormality
- *Heart disease:* congestive heart failure with adjunct signs

- 369 eligible necropsies (2022):
  - 129 (35%) heart lesion
  - 10 (2.7%) heart disease

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Heart measurements

Area and circumference of heart

Area and circumference of the lumen of ventricles

Thickness of ventricles and septum

Greater left and right ventricular lumen area were associated with probability of heart lesions

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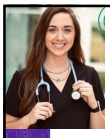

Respiratory System Objectives

1. Utilize gross necropsy to determine the frequency of pulmonary lesions associated with AIP, BP, BIP.
2. Assess the accuracy of recognizing AIP, BP, BIP gross respiratory lesions to corresponding histopathological samples.

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Terminology

- **BP:** Bronchopneumonia
- **AIP:** Acute Interstitial Pneumonia
- **BIP:** Bronchopneumonia with an Interstitial Pneumonia/Pattern
- **GrossDx:** Gross Diagnosis
- **HistoDx:** Histopathological Diagnosis

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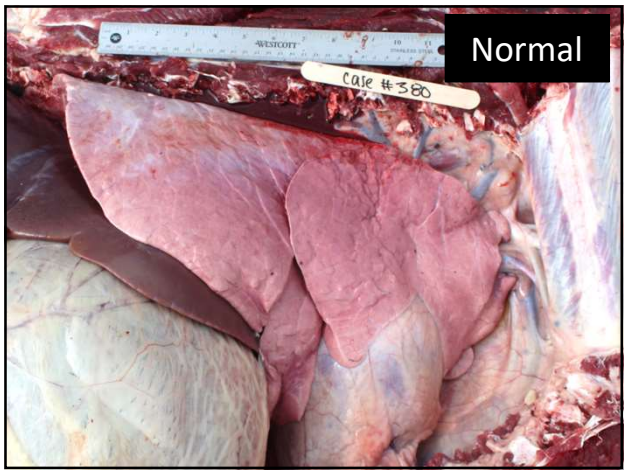
Normal
Case #380

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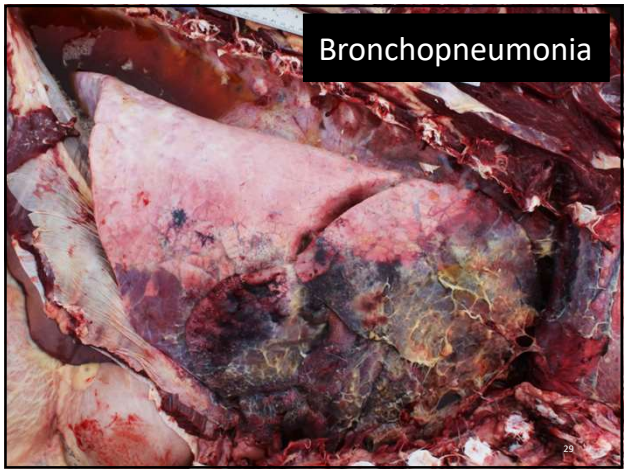
Bronchopneumonia

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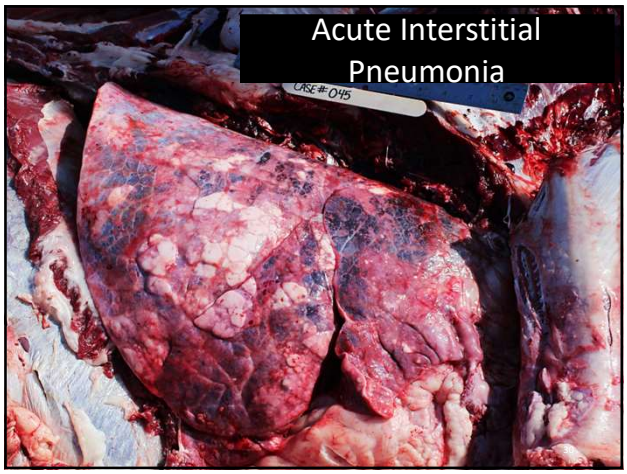
Acute Interstitial Pneumonia
CASE #045

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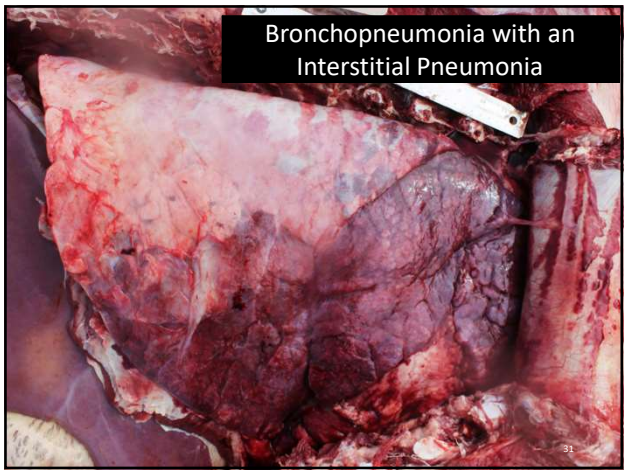

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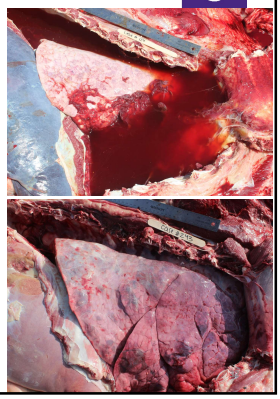
Undifferentiated Lung Lesions

- Did not meet the criteria for BP, AIP, BIP
- Healthy lungs



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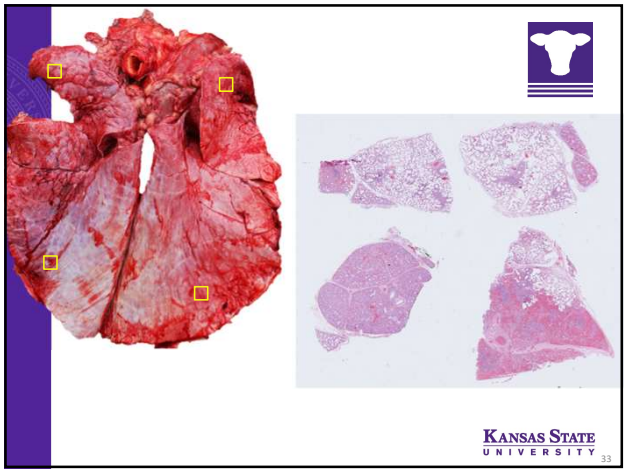

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Results Outline

- Frequency of GrossDx **(n= 402)**
- Frequency of HistoDx **(n=189)**
- Probability of Agreement between GrossDx and HistoDx **(n=172)**
- Probability of Agreement between Histo sample Location **(n= 172)**

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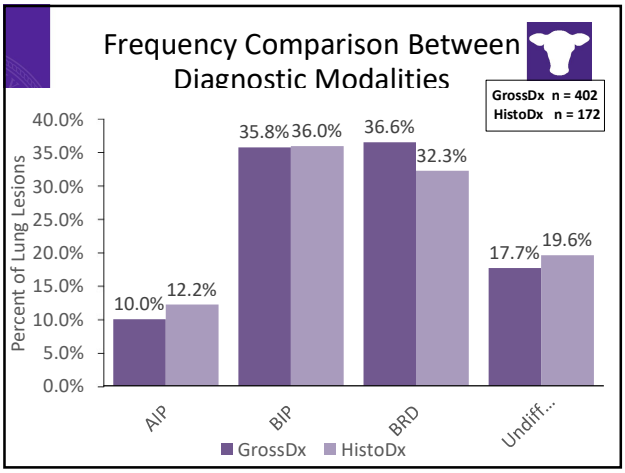
Frequency Comparison Between Diagnostic Modalities



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Individual Case Classification based on Cases Diagnosed with each Methodology

	HistoDx		
GrossDx	AIP	BIP	BP
AIP	3	8	1
BIP	10	44	32
BP	6	13	21

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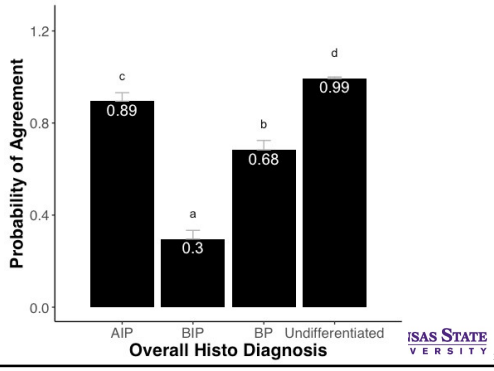
Probability of Agreement between Histopathology Samples with Case Diagnosis



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Respiratory Conclusions

- BP and BIP represented the most common respiratory lesions
  - BP: 36.6%
  - BIP: 35.8%
- BIP lung lesions were present in both gross and histopathological diagnostics

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Systemic Necropsy

Feedyard Results

Calf Ranch Results

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Beef:Dairy

- 211 systemic necropsies (6/15/23-7/15/23)
- Multiple KS calf ranches
- 99 heifers, 112 steers
- 115 beef:dairy, 81 Holstein, 15 Jersey
- 145 head with birthdate information

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Frequency of final diagnosis

Final Diagnosis	Cases	% of Cases
Acute_BP	29	13.7%
Asp_Emb_BP	8	3.8%
BIP	9	4.3%
Chronic BP	104	49.3%
GI_Scours	39	18.5%
Other_Unknown	7	3.3%
Septicemia	15	7.1%

Acute_BP = acute bronchopneumonia, ***Asp_Emb_BP*** = aspiration and embolic pneumonia; ***BIP*** = bronchopneumonia with an interstitial pattern; ***Chronic BP*** = chronic bronchopneumonia; ***GI_Scours*** = gastrointestinal disease and scours; ***Other_unknown*** = all other diagnoses; ***Septicemia*** = signs of systemic clinical illness

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Acute Bronchopneumonia

Chronic Bronchopneumonia

Chronic BP with miliary pattern

BP with interstitial pattern

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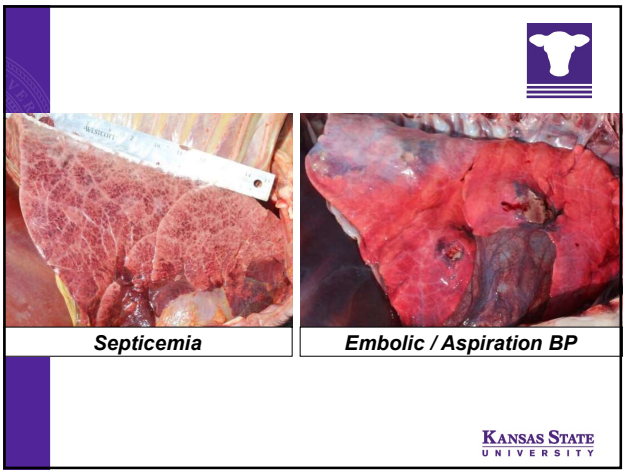
Septicemia
Embolic / Aspiration BP
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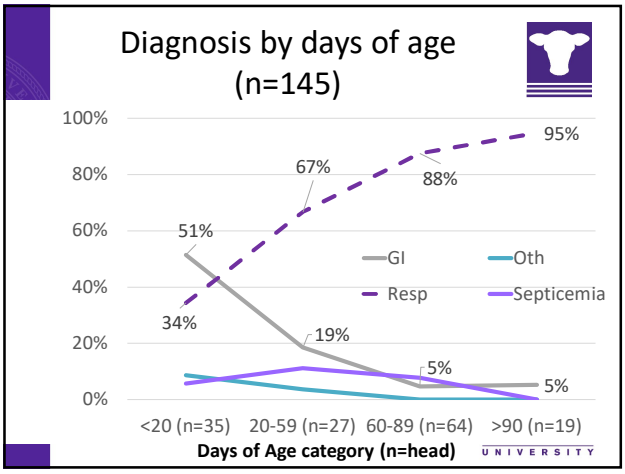
Diagnosis by days of age (n=145)
100%
80%
60%
40%
20%
0%
95%
67%
88%
51%
GI
Oth
Resp
Septicemia
34%
19%
5%
5%
<20 (n=35)
20-59 (n=27)
60-89 (n=64)
>90 (n=19)
Days of Age category (n=head)
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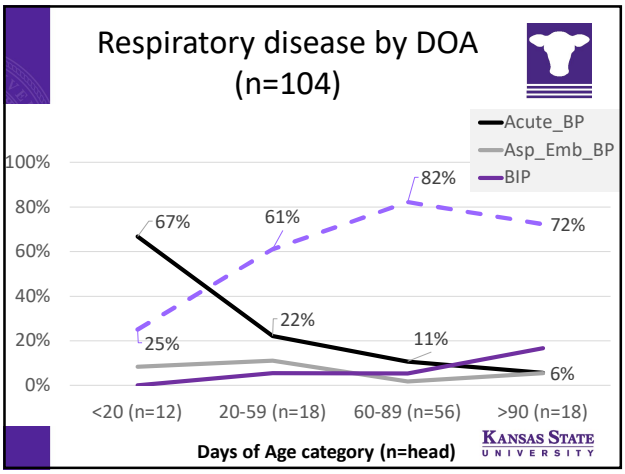
Respiratory disease by DOA (n=104)
Acute_BP
Asp_Emb_BP
BIP
100%
80%
60%
40%
20%
0%
82%
67%
61%
72%
22%
25%
11%
6%
<20 (n=12)
20-59 (n=18)
60-89 (n=56)
>90 (n=18)
Days of Age category (n=head)
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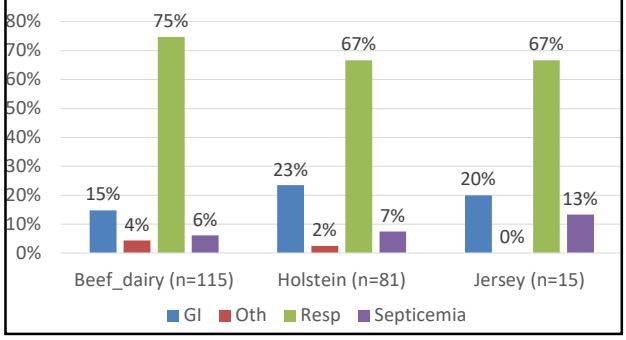
Diagnosis comparison by breed (n=211)



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- Systemic Necropsy
- Feedyard Results
- Calf Ranch Results

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Schmidt P, White B, Finley A, Bortoluzzi E, Depenbusch B, Mancke M, Brown R, Jensen M, Lancaster P, Larson R. Determining frequency of common pulmonary gross and histopathological findings in feedyard fatalities. Journal of Veterinary Sciences 2023 10(3), 228; https://doi.org/10.3390/vetsci10030228.

Bortoluzzi E, Schmidt P, Brown R, Jensen M, Mancke M, Larson R, Lancaster P, White B. Image classification and automated machine learning to classify lung pathologies in deceased feedlot cattle. Journal of Veterinary Sciences 2023 *10*(2), 113; https://doi.org/10.3390/vetsci10020113.

E.M. Bortoluzzi, B.J. White, P.H. Schmidt, M.R. Mancke, R.E. Brown, M.Jensen, P.A. Lancaster, R.L. Larson. Epidemiological factors associated with gross diagnosis of pulmonary pathology in feedyard mortalities. *Vet Sci* 10(522). 2023. https://doi.org/10.3390/vetsci10080522

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