

Enhanced Veterinary Diagnostics and Antimicrobial Stewardship

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Nebraska Veterinary Diagnostic Center



- Full service Veterinary Diagnostic Laboratory
- AAVLD Accredited
- USDA NAHLN Tier 1 Laboratory
 - FAD Testing and Surveillance
- FDA CVM Vet-LIRN
- CLIA- SARS-CoV-2
- Pathology, Virology, Bacteriology, Histology, Parasitology, and Molecular Diagnostics




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Bovine Respiratory Disease (BRD)

- 6.1 Million+ Cattle in Nebraska worth \$7.2 billion
- Most costly disease of beef cattle in North America- **>\$1 Billion USD/year**
- Caused by gram negative bacteria in *Pasteurellaceae* family (*Mannheimia*, *Pasteurella*), *Haemophilus* (*Histophilus somni*), and *Mycoplasmataceae* (*Mycoplasma*)
- One of the most frequent causes of AM use in cattle

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Susceptibility testing for BRD pathogens

Gold Standard: Minimum inhibitory concentration (broth microdilution)
 Requires isolation of pathogen in pure culture
 Overnight incubation in panels
 Rapid molecular workflows available for BRD pathogens for tissues and swabs
 Increased detection of pathogens (Loy 2018)
 Isolate not available for downstream MIC testing
 Compared 297 lungs and 111 ns using culture and sensitivity vs real time PCR for presence of AMR

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PCR can be used to detect
AST

AMR PCR, when performed with lungs containing resistant *M. haemolytica* were 78% sensitive and 95% specific and had a positive predictive value of 92% when compared with gold standard MIC sensitivity testing

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Additional Tools: MALDI-TOF

MALDI (Matrix Assisted Laser Desorption Ionization)
 1. Irradiation
 2. Desorption
 3. Desolvation & Ionization

MALDI TOF (Time of Flight) detection

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MALDI-TOF: Can tell us if bacteria is more likely AMR

- Example: *M. haemolytica*
- Serotypes associated with virulence
- Genome SNP analysis by Clawson *et al*
 - 1133 North American Isolates
 - 2 major genotypes
 - Type 1 – Associated with nasopharynx in non-BRD
 - Type 2- Associated with lungs and BRD
 - Type 2b only found with AMR
- MALDI-TOF analysis can tell if a culture has Type 2 (potentially AMR) in a matter of minutes

Association of Serotype 1 *M. haemolytica* with the range of cattle with respiratory disease

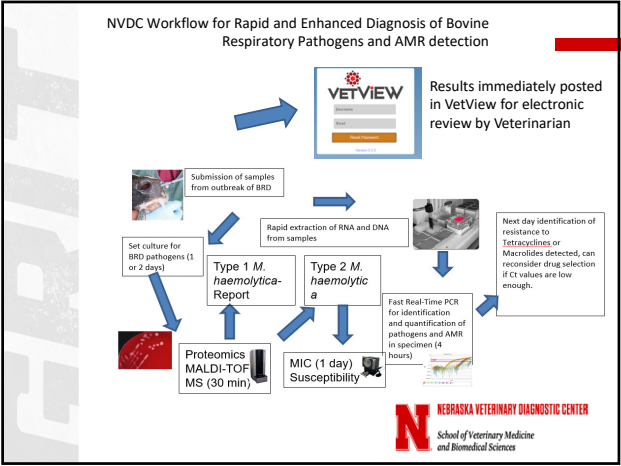
Sample	IS1	IS2
Serotype 1	94.0	94.0
Reference (GenBank) AF001001	94.0	94.0

Association of Serotype 2 *M. haemolytica* with the combined occurrence of IS1, IS2, IS3 and other related serotypes

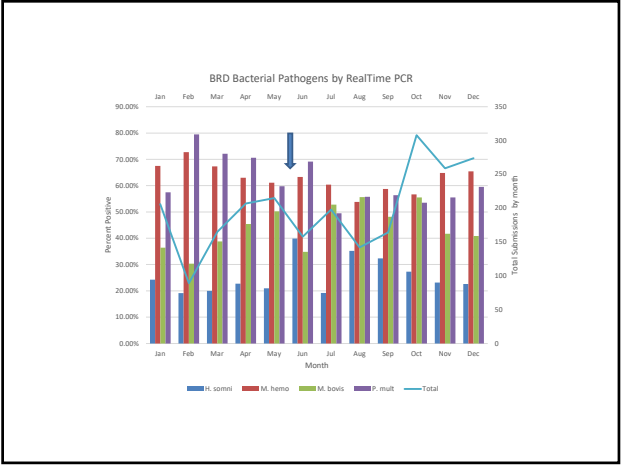
Sample	IS1	IS2	IS3
Serotype 2	94.0	94.0	94.0
Reference (GenBank) AF001001	94.0	94.0	94.0

Legend: Serotype 1 (red), Serotype 2 (blue), Serotype 2b (green)

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