

TIMELY INFORMATION

Agriculture & Natural Resources

September 2011

A Survey of Bovine Respiratory Disease Cases and Liver Copper Concentrations from Submissions to a South Alabama Diagnostic Laboratory

Joel L. Cline¹, J. Scott Helton¹, Lanqing Li², John F. Roberts², and Soren P. Rodning³

¹J. B. Taylor Veterinary Diagnostic Laboratory, Elba, AL

²Thompson Bishop Sparks State Diagnostic Laboratory, Auburn, AL

³Auburn University Department of Animal Sciences, Auburn, AL

Bovine respiratory disease (BRD) is the most common and costly disease of beef cattle¹ that develops as a result of interactions between environmental and management factors, animal factors, and infectious agents (viruses and bacteria). Environmental and management factors such as weaning, transportation, commingling, crowding, and inadequate ventilation are stressors that negatively impact an animal's defense mechanisms. In addition, crowding and inadequate ventilation can enhance the transmission of the many infectious agents associated with BRD. The most common viruses associated with BRD include bovine herpesvirus 1 (causative agent of infectious bovine rhinotracheitis; IBR), bovine viral diarrhea virus (BVDV), bovine respiratory syncytial virus (BRSV), and parainfluenza-3 Virus (PI₃), and the most common bacteria typically found in the lungs of cattle affected with BRD include *Mannheimia haemolytica*, *Pasteurella multocida*, *Histophilus somni*, and *Mycoplasma* species. Many cases of BRD begin with an initial viral infection that weakens an animal's immune and respiratory defense mechanisms, allowing colonization of the lungs by bacteria resulting in pneumonia. As a result of the negative health consequences associated with BRD, cattle producers spend a tremendous amount of time, labor, and money to prevent and/or treat BRD through environmental and nutritional management, vaccinations, and antibiotic therapy.

To assist cattle producers in targeting the most effective prevention and treatment strategies for BRD in Alabama, submissions to the Alabama Department of Agriculture and Industries J. B. Taylor Diagnostic Laboratory in Elba, AL from October 1, 2009 through September 30, 2010 were reviewed to determine the incidence of various bacteria and viruses in the lungs of cattle diagnosed with pneumonia. A total of 44 animals from 26 farms were identified with an age range from 21 days to 9 years. Of the 44 animals, 43 were beef cattle and 1 was a dairy heifer. These cattle represented cases where pneumonia was the primary disease condition identified as well as cases when pneumonia occurred in conjunction with a variety of other conditions.

Of the 44 records reviewed, 14 species of bacteria were identified in the pneumonic lung tissues with multiple species often present in an individual animal (Table 1). Thirty-two cases involved some species of *Mycoplasma* (72.7%), with *Mycoplasma bovis* being the most common bacteria present in pneumonic lungs with 23 identifications from the 44 cases (52.3%). The second most common bacteria identified was *Mannheimia haemolytica* (19 cases, 43.2%), followed by

ALABAMA A&M AND AUBURN UNIVERSITIES, AND TUSKEGEE UNIVERSITY, COUNTY GOVERNING BODIES AND USDA COOPERATING

Escherichia coli (13 cases, 29.6%) and *Pasteurella multocida* (10 cases, 22.7%). *Histophilus somni* was only isolated from two cases (4.6%). Other bacteria identified were *Mycoplasma dispar* (5 cases, 11.4%), *Mycoplasma arginini* (4 cases, 9.1%), *Proteus* species (3 cases, 6.8%), *Mycoplasma bovirhinis* (2 cases, 4.6%), *Pseudomonas aeruginosa* (1 case, 2.3%), *Bacillus sp.* (1 case, 2.3%), *Staphylococcus aureus* (1 case, 2.3%) and *Mycoplasma alkalescens* (1 case, 2.3%).

Table 1. A summary of the bacteria identified from all 44 cases involving bovine pneumonia. **Multiple bacterial species were often present in the lungs of an individual animal.**

Bacteria	Number of pneumonia cases in which this bacteria was identified	Percentage of pneumonia cases in which this bacteria was identified
<i>Mycoplasma</i> species	32	72.7%
➤ <i>Mycoplasma bovis</i>	23	52.3%
➤ <i>Mycoplasma dispar</i>	5	11.4%
➤ <i>Mycoplasma arginini</i>	4	9.1%
➤ <i>Mycoplasma bovirhinis</i>	2	4.6%
➤ <i>Mycoplasma alkalescens</i>	1	2.3%
<i>Mannheimia haemolytica</i>	19	43.2%
<i>Escherichia coli</i>	13	29.6%
<i>Pasteurella multocida</i>	10	22.7%
<i>Proteus</i> species	3	6.8%
<i>Histophilus somni</i>	2	4.6%
<i>Pseudomonas aeruginosa</i>	1	2.3%
<i>Bacillus</i> species	1	2.3%
<i>Staphylococcus aureus</i>	1	2.3%

Lung and spleen tissue from each of the 44 head were also tested for the presence of bovine herpesvirus 1 (the causative agent of infectious bovine rhinotracheitis; IBR), bovine respiratory syncytial virus (BRSV), and bovine viral diarrhea virus (BVDV). IBR and BRSV were not identified in any of the cattle tested. **However, 8 of the 44 head tested positive for the presence of BVDV (18.2%).** Neither bacteria nor viruses were identified in one animal (2.3%).

Cases of pneumonia in yearling and stocker cattle

Of the 44 total head with pneumonia, 26 cases were examined that were reported to be from 6 months to one year of age or were reported as “yearling” or “stocker”. From these 26 head, some species of *Mycoplasma* was identified from 21 cases (80.8%). Again, *Mycoplasma bovis* was the most common bacteria identified from the lung tissue with 17 cases involving *M. bovis* (65.4%). Other bacteria identified from these 26 head were *Mannheimia haemolytica* (12 cases, 46.2%), *Escherichia coli* (6 cases, 23.1%), *Pasteurella multocida* (5 cases, 19.2%), *Mycoplasma arginini* (3 cases, 11.5%), *Mycoplasma bovirhinis* (2 cases, 7.7%), *Mycoplasma dispar* (2 cases, 7.7%), *Proteus* species (2 cases, 7.7%), *Staphylococcus aureus* (1 case, 3.9%), and *Histophilus somni* (1 case, 3.9%). **BVDV was identified in 7 cases (26.9%)**. These 26 case submissions came from 13 farm premises with several premises submitting more than one animal. **Of the 13 farms represented, some species of *Mycoplasma* was identified at least once from 10 of 13 premises (76.9%)**. *M. bovis* was identified on 9 of 13 premises (69.2%), and BVDV was identified on 4 of 13 premises (30.8%).

Table 2. A summary of the bacteria identified from the 26 cases involving bovine pneumonia in yearling and stocker cattle. **Multiple bacterial species were often present in the lungs of an individual animal.**

Bacteria	Number of pneumonia cases in which this bacteria was identified	Percentage of pneumonia cases in which this bacteria was identified
<i>Mycoplasma</i> species	21	80.8%
➤ <i>Mycoplasma bovis</i>	17	65.4%
➤ <i>Mycoplasma arginini</i>	3	11.5%
➤ <i>Mycoplasma bovirhinis</i>	2	7.7%
➤ <i>Mycoplasma dispar</i>	2	7.7%
<i>Mannheimia haemolytica</i>	12	46.2%
<i>Escherichia coli</i>	6	23.1%
<i>Pasteurella multocida</i>	5	19.2%
<i>Proteus</i> species	2	7.7%
<i>Staphylococcus aureus</i>	1	3.9%
<i>Histophilus somni</i>	1	3.9%

Survey of liver copper concentrations

The J. B. Taylor Diagnostic Laboratory is currently involved in a survey of liver copper concentration for all cattle submitted to the laboratory. Copper deficiency contributes to poor

production in cattle^{2,3} and negatively influences various components of the immune system.^{2,4,5,6} The liver copper concentration for the 26 yearling calves with pneumonia were analyzed using the reference levels of 0.5-10 parts per million (ppm) as deficient, 5-25 ppm as marginal, and 25-550 ppm as normal concentrations.² Of the 26 head, 3 had liver copper concentrations considered deficient (11.5%), 4 had copper concentrations between 5 ppm and 10 ppm which may be marginal or deficient (15.4%), 10 had concentrations considered marginal (38.5%), and only 9 had concentrations considered normal (34.6%). Of the 13 farm premises these cattle came from, animals below the normal liver copper concentration were identified on 7 of 13 premises (53.8%).

Take home message

The data collected at the J. B. Taylor Diagnostic Laboratory demonstrates the importance of *Mycoplasma* species, *Mannheimia haemolytica*, and BVDV in many severe cases of BRD from south Alabama and suggests that the copper status of these herds should also be investigated. While BRD is clearly a complex interaction between environmental and management factors, animal factors, and infectious agents (viruses and bacteria), use this diagnostic information to more effectively prevent, control, and treat BRD. For example:

1. When treating cases of BRD, use antibiotics approved for use against *Mycoplasma* and *Mannheimia haemolytica*.
2. Implement an effective BVDV control plan for your farm including an appropriate combination of biosecurity, testing and culling of PI animals (diagnostic surveillance), and vaccination.
3. Evaluate your herd's nutritional program to ensure your animals are receiving adequate amounts of protein, energy, vitamins, and minerals.

If an animal dies on your farm, contact your veterinarian to conduct a necropsy to attempt to determine the cause. In some cases, an on-farm necropsy will be enough to establish a diagnosis; however, this is not always true. Laboratory tests at a veterinary diagnostic laboratory, such as microscopic examination of organs, may be necessary to confirm a diagnosis of some infectious diseases, and your veterinarian can send samples to a veterinary diagnostic laboratory if necessary. If a veterinarian is not readily available to conduct a necropsy, then submit the animal directly to one of the four Alabama Department of Agriculture and Industries Veterinary Diagnostic Laboratories located in Auburn, Boaz, Elba, or Hanceville:

Alabama Department of Agriculture Veterinary Diagnostic Laboratories:

Auburn	(334) 844-4987
Boaz	(256) 593-2995
Elba	(334) 897-6340
Hanceville	(256) 352-8036

Knowing why your animals died will help you protect the health of the rest of the herd.

References

1. Giffin D. Economic impact associated with respiratory disease in beef cattle. *Bovine Respiratory Disease Update. Vet Clin North Am Food Anim Pract* 1997;13:367-377.
2. Wikse, S.E., D. Herd, R. Field, and P. Holland. Diagnosis of copper deficiency in cattle. *JAVMA*. June 1, 1992. 200(11): 1625-1629.
3. Smart, M. E., N. F. Cymbaluk and D. A. Chistensen. A review of copper status of cattle in Canada and recommendations for supplementation. *Can Vet J*. March 1992; 33(3): 163-170.
4. Dorton, K. L., T. E. Engle, D. W. Hamar, P. D. Siciliano and R. S. Yemm. Effects of copper source and concentration on performance, copper status, and immune function in growing and finishing feedlot steers. *Animal Feed Science and Technology*. November 2003, 110 (1-4): 31-44.
5. Genglbach, G. P. and J. W. Spears. Effects of dietary copper and molybdenum on copper status, cytokine production, and humoral immune response of calves. *J Dairy Sci*. 1998; 81: 3286-3292.
6. Suttle, N.F., D. G. Jones. Recent developments in trace element metabolism and function: trace elements, disease resistance and immune responsiveness in ruminants. *J Nutr*. 1989; 119: 1055-1061.

Acknowledgements

The authors gratefully acknowledge the contributions of the staff of the J. B. Taylor Veterinary Diagnostic Laboratory in Elba, AL; the staff of the Thompson Bishop Sparks State Diagnostic Laboratory in Auburn, Alabama; Dr. Fred Hoerr, Director of Laboratories; and the Alabama Department of Agriculture and Industries.