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PREVALENCE OF *MYCOPLASMA BOVIS* IN BOVINE PNEUMONIA AND ARTHRITIS

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Summary

Samples from cattle with pneumonia and/or arthritis were cultured for *Mycoplasma*. When requested, the *Mycoplasma* isolates were further identified to species by polymerase chain reaction or restriction fragment length polymorphism. The records of all cases where mycoplasma testing was performed were examined and other infectious agents known to cause pneumonia or arthritis were recorded. *Mycoplasma* species were isolated from 85% of the lung samples and 69% of the joint samples. Eighty-four percent of the 81 *Mycoplasma* isolates that were further identified were *M. bovis*, which clearly made it the most common pathogenic agent identified in samples from cattle with pneumonia and/or arthritis. *M. bovis* appeared to play an important role in feedlot pneumonia and was the most common cause of arthritis. Unfortunately, treatment and prevention options are currently either ineffective or their effectiveness is unknown.

(Key Words: Bovine, Pneumonia, Arthritis, *Mycoplasma bovis*.)

Introduction

Pneumonia is the most common and serious disease problem that affects beef cattle. Bacteria such as *Mannheimia* (*Pasteurella*) *haemolytica*, *Pasteurella multocida*, and *Haemophilus somnus*, and viruses such as infectious bovine

rhinotracheitis virus, bovine virus diarrhea virus, parainfluenza type 3 virus, and bovine respiratory syncytial virus, acting independently or in association with one another, are considered to be the major causes of bovine pneumonia. *Arcanobacterium* (*Actinomyces*) *pyogenes* is frequently isolated from chronically infected lungs, but it is usually thought to invade after another agent has damaged the lungs. Recently, there has been considerable interest in *Mycoplasma bovis* as a cause of pneumonia and arthritis that fails to respond to treatment. The purpose of this project was to first determine the frequency of isolation of *Mycoplasma* species, especially *M. bovis*, from bovine lung and joint samples submitted to the Kansas State University Veterinary Diagnostic Laboratory, and second to compare that frequency to the frequency for which other respiratory pathogens were identified.

Experimental Procedures

The records of bovine cases submitted between May 1999 and December 2001 in which mycoplasma testing was performed were examined and the results recorded. Culture for *Mycoplasma* spp. was by inoculation onto Friis agar and by inoculation into Friis broth followed by subculture onto agar. Agar plates were examined between 2 and 10 days after inoculation for *Mycoplasma* colonies. When requested by the

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submitting veterinarian or owner, *Mycoplasma* isolates were identified to species by polymerase chain reaction (PCR) using species-specific primers or by restriction fragment length polymorphism of the DNA product obtained by PCR using genus-specific primers. Identification of other bacteria was by routine culture procedures, and identification of viruses was by fluorescent antibody staining and/or virus isolation.

Results and Discussion

Mycoplasma were isolated from 157 of 185 (84.9%) lung samples and from 82 of 119 (68.9%) joint samples (Table 1). In cases where both lung and joint samples were included in the same submission (*Mycoplasma* isolation was not requested for both types of samples in all cases), 27 of 30 (90.0%) lung samples and 28 of 37 (75.7%) joint samples were culture positive. Of the 81 *Mycoplasma* isolates identified as to species, 68 (83.9%) were *M. bovis*. There were six isolates of *M. arginini*, one each of *M. alkalescence*, *M. bovirhinis*, and *M. canadense*, and four that were not further identified after the PCR indicated they were not *M. bovis*. In 7 of the 13 cases where a non-*M. bovis* species was identified, *M. bovis* was also isolated from the sample. Other pathogens that were identified are listed in Table 1.

Mycoplasma species easily were the most common agents isolated from lung and joint samples from cattle with pneumonia and arthritis, and 84% of the isolates that were further identified were *M. bovis*. In many cases, pneumonic lungs contained no identifiable pathogen, except *Mycoplasma*, and a large majority of joint samples were culture-negative except for *Mycoplasma*. A 1980 study from California reported that *Mycoplasma* species were isolated from 86% of the lungs from 500 feedlot cattle, and that 76% of the isolates that were identified were *M.*

bovis alone or in combination with another *Mycoplasma*. Recently, *M. bovis* has been touted as an emerging disease of cattle and associated with the presence of multiple abscesses in the lungs of cattle with chronic bronchopneumonia. Examination of our records revealed that *M. bovis* was present in lungs from cattle with acute bronchopneumonia, chronic bronchopneumonia without abscesses, and acute interstitial pneumonia, as well as cases of chronic bronchopneumonia with abscesses. Our results, as well as the earlier report from California, indicate that *M. bovis* is common in the lungs of cattle dying of all types of pneumonia, and most likely it is not an emerging disease, but one that over the years has been underdiagnosed.

Most *Mycoplasma* species that have been isolated from cattle lungs do not cause any disease when put back into cattle. After infection with only *M. bovis*, most cattle do not become visibly sick, but the organism causes a small amount of lung damage from which *M. bovis* can be isolated for months. Perhaps more importantly, *M. bovis* increases the severity of pneumonia caused by *Mannheimia* (*Pasteurella*) *haemolytica* and *Pasteurella multocida*, especially if the calves are infected with *M. bovis* before infection with other bacteria. Several people have found that on arrival at a feedlot, a large majority of cattle already have been exposed to *M. bovis*. After a month on feed, almost all feedlot cattle have been exposed, and after exposure most animals remain infected for months. Therefore, almost all cattle in most feedlots are infected with *M. bovis*, and one would expect to isolate the organism from a large proportion of pneumonic lungs, regardless of the cause of the pneumonia. This makes it very difficult be certain of the role of *M. bovis* in bovine pneumonia, but many veterinarians and researchers feel that it plays an important role, probably by increasing the severity of other respiratory infections.

After infection of the respiratory tract, *M. bovis* usually invades the blood, from which it can be isolated for several days. Usually calves clear the organism from their blood without further problems, but occasionally *M. bovis* settles in the joints and causes arthritis. Lung damage, regardless of the cause, provides an excellent environment for growth of *M. bovis* and results in pockets with high numbers of organisms. These act as reservoirs from which *M. bovis* can invade the blood and infect joints, where it is a proven cause of arthritis. Unfortunately, treatment, even with antibiotics that are

effective in killing *M. bovis* in the laboratory, usually do not cure the lameness. Vaccines are available, but their effectiveness is not known. Because *M. bovis* is so common, it is not feasible to try to buy *M. bovis*-free cattle. The best preventative for mycoplasma arthritis in cattle appears to be doing everything possible to prevent pneumonia caused by other agents, and when it occurs to treat it early and limit the severity of the pneumonia. More research is required to fully understand and control *M. bovis*.

Table 1. Numbers of *Mycoplasma* Species and Other Pathogens Isolated from Lungs and Joints of Cattle

Agent	Source of Isolate	
	Lungs (n=185)	Joints (n=119)
<i>Mycoplasma</i> species	157	82
<i>Mannheimia haemolytica</i>	66	1
<i>Pasteurella multocida</i>	72	4
<i>Haemophilus somnus</i>	34	1
<i>Arcanobacterium pyogenes</i>	23	7
<i>Salmonella</i> spp.	4	
<i>Streptococcus</i> spp.		5
<i>Chlamydophila</i> (<i>Chlamydia</i>)		1
Bovine virus diarrhea virus	5	
Bovine respiratory syncytial virus	4	