Clinical History

A 2-month-old Holstein bull calf with a history of droopy ears and poor weight gain was submitted alive for euthanasia and necropsy to the Diagnostic Center for Population and Animal Health at Michigan State University. The owner reported that 6 to 8 calves with similar signs in the same herd had died or been euthanized in the preceding 30 days; some affected calves had additionally developed signs of ataxia prior to death.

Gross Findings

The calf was euthanized with an IV overdose injection of pentobarbital sodium. At necropsy, the calf was markedly emaciated (40.9 kg [90 lb]), with little pericardial, perirenal, and mesenteric fat. The remaining fat around the heart and kidneys was red and gelatinous (serous atrophy). The cranioventral aspects of both lungs were firm and red to purple, with numerous spherical, 3- to 5-mm-diameter nodules (Figure 1). The centers of many of the nodules were white and pasty. Approximately 66% of the right lung and 33% of the left lung were affected, and there was a distinct line of demarcation between the firm, affected areas and the apparently normal, spongy, pink caudodorsal portions. The right tracheobronchial lymph node was enlarged. Both tympanic bullae were soft and collapsed under digital pressure; they were filled with white pasty material. Bony septa within the bullae were not visible.

Formulate differential diagnoses from the history, clinical findings, and Figure 1—then turn the page →

Figure 1—Photographs of the lung surface (A) and tympanic bullae (B) of a bull calf that was euthanized for necropsy because of droopy ears and poor weight gain. Notice the extensive suppurative bronchopneumonia and the severe bilateral suppurative otitis media.
Histopathologic and Microbiological Findings

Sections of affected tissue from the right lung (cranioventral portion) and unaffected right lung (caudodorsal portion) were examined histologically. In affected areas, there was diffuse consolidation of the parenchyma; bronchi and bronchioles were distended with necrotic debris and inflammatory cells, and compression or collapse of surrounding alveoli was evident. The lining epithelium of the ectatic airways was effaced, and the central necrotic luminal contents were partially mineralized (Figure 2). This core of caseous necrotic debris was surrounded by a zone of degenerated and viable neutrophils and macrophages, and the walls of the airways and the peribronchial and peribronchial interstitium contained moderate numbers of lymphocytes, plasma cells, and macrophages. Elsewhere in the affected lung tissue, there was consolidation caused by suppurative exudate in airways and alveoli. Inflammation was so severe in these areas that alveolar architecture was obscured or effaced. In grossly nonconsolidated areas of the lung tissue, there was diffuse congestion, and the peribronchial and peribronchial interstitium contained increased numbers of mononuclear inflammatory cells.

*Mycoplasma bovis* organisms were detected by immunohistochemical staining in some foci of inflammation (Figure 3) and in the apical portion of numerous intact bronchiolar epithelial cells bordering the areas of inflammatory changes.

Numerous *M. bovis* and moderate numbers of *Pasteurella multocida* were cultured from samples of lung tissue. Microbial cultures of samples from the middle ear yielded *Acinetobacter* sp, nonhemolytic *Streptococcus* sp, and rare *Bacillus* sp, in addition to *M. bovis*.

Morphologic Diagnosis and Case Summary

**Morphologic diagnosis:** severe extensive suppurative bronchopneumonia and bilateral severe diffuse suppurative otitis media.

**Case summary:** *Mycoplasma bovis*-associated bronchopneumonia and otitis media in a calf.

Comments

*Mycoplasma bovis* is a known cause of mastitis, infertility, arthritis, and pneumonia in cattle. Arthritis is the predominant clinical consequence of infection, although it can often be concurrent with mastitis or pneumonia. The microorganism can be shed in secretions of the respiratory tract, genital tract, or mammary glands. Respiratory tract disease generally develops in calves that are 1 to 4 months old. Infected animals often develop signs of disease when debilitated as a result of an underlying condition or when stressed. Gagea et al reported that *M. bovis*-associated bronchopneumonia was identified in 54 of 99 feedlot beef calves that died or were euthanized; 25 of the 54 calves also had arthritis. Otitis media was diagnosed in 7 of the 99 feedlot calves, but *M. bovis* was isolated from samples of the tympanic bullae of only 3 of those animals. In another study,
16 of 64 (25%) veal calves with pnuemonic lesions at slaughter were positive for *M. bovis* (determined on the basis of results of bacterial isolation and immunohistochemical staining).

In the call of this report, a diagnosis of *M. bovis* infection was tentatively established clinically on the basis of droopy ears and poor weight gain. Additional reported abnormalities associated with *M. bovis* infection include signs of depression, nasal discharge, swollen joints, and reluctance to rise.5,6

At necropsy, the findings of suppurative bronchopneumonia and otitis media supported the presumptive clinical diagnosis of *M. bovis* infection for the call of this report. Additional gross findings related to *M. bovis* infection may include fibrinous pleuritis and fibrinonecrotizing polyarthritis,7 but these were not evident in this case. Histologically, lesions caused by *M. bovis* are typically characterized by suppurative bronchopneumonia with bronchiectasis, fibrinous pneumonia with irregular areas of coagulative necrosis, or multifocal pyogranulomatous inflammation with centers of caseous necrosis and abscess formation.2,7,8

A definitive diagnosis of *M. bovis* infection requires histologic examination, bacterial culture, PCR assay, ELISA, or immunohistochemical analysis of samples of the lungs and middle ear.5,6,9 For live animals, results of PCR assay or culture of transtracheal wash or bronchoalveolar lavage fluid samples may provide a diagnosis. Bacterial culture of nasal swab specimens has lower sensitivity (21%), compared with culture of bronchoalveolar lavage fluid samples, for prediction of *M. bovis*–associated lung disease.10 In calves with arthritis, affected joints or tendon sheaths can be aspirated to obtain samples for microbiological testing.11,12 Also, it is not uncommon for bacterial culture of samples to yield *M. bovis* along with other bacteria, as illustrated by the case described in this report. It has been proposed that lesions of fibrinosuppurative bronchopneumonia initiated by infections with *Mannheimia haemolytica*, *Histophilus somni*, and *P. multocida* may be secondarily colonized and perpetuated by *M. bovis*, which can also colonize healthy bovine lung tissue without causing pneumonia.2 Thus, it is important to identify not only infection with this organism, but also the presence of characteristic clinical signs or lesions.2

Approved treatments for *M. bovis* infection in calves in the United States include tulathromycin, enrofloxacin, florfenicol, oxytetracycline, streptomycin, tilmicosin, and tylosin;1 however, many isolates are resistant to tetracycline, oxytetracycline, and tylosin as well as spectinomycin and lincomycin.12 In addition to antimicrobials, the use of anti-inflammatory drugs can be beneficial because the inflammatory response may contribute to disease associated with *M. bovis* infection.3 Treatment is frequently unrewarding, however, either because it has to be provided over a long period or because the affected calf fails to respond. Thus, calves with *M. bovis* infection usually die or are euthanized.13 Elimination of the disease from a herd often involves culling of infected animals, such as cows with *Mycoplasma* mastitis. It is important to avoid feeding milk and colostrum from such infected cows to calves. In instances where that procedure is unavoidable, pasteurization of the milk is recommended.1 For calves, inoculation with an experimental quadrivalent inactivated vaccine has been shown to provide some protection against respiratory tract disease caused by *M. bovis*.13 In another study,14 calves administered a saponised inactivated vaccine developed fewer respiratory tract signs and less damage to the lungs and had less weight loss and lower rectal temperatures after challenge with a virulent strain of *M. bovis*, compared with findings in unvaccinated calves. However, these vaccines are not yet available for commercial use. Therefore, currently, the best way to avoid development of *M. bovis*–associated disease in cattle is to maintain a closed herd and keep newly purchased animals under quarantine for a period.

References