

# Gross Pathology of Thoracic Viscera

**Wade L. Kadel, D.V.M., M.S.**  
Director, Diagnostic Laboratory  
Kentucky Department of Agriculture  
Division of Livestock Sanitation  
Animal Disease Diagnostic Laboratory  
Hopkinsville, Ky. 42240

The clinical signs for the various types of pneumonia are so similar that a post-mortem examination and/or diagnostic laboratory testing is required to determine the etiology. Most practitioners have determined through education and trial and error effective methods of therapy for bovine pneumonia. Assistance is requested from the diagnostic laboratory when standard methods of therapy have failed. Unfortunately, many times the request from the owner for practitioner assistance comes after the owner has tried his hand at therapy. The gross examination of thoracic viscera is sufficient in many cases to reveal a tentative diagnosis sufficient to indicate appropriate therapy.

The purpose of this presentation is to compare the clinical signs and gross lesions for a few commonly misdiagnosed causes of bovine pneumonia. Effective therapy must be preceded by a prompt and accurate diagnosis. The data presented are to assist in determining the diagnosis. Methods to effect prophylaxis and therapy for bovine pneumonia are not included in this presentation. The types of pneumonia to be compared are viral pneumonia, *Pasteurella* pneumonia, infectious bovine rhinotracheitis, verminous pneumonia and atypical interstitial bovine pneumonia.

*Pasteurella* pneumonia due to infections from *Pasteurella multocida* and *P. hemolytica* is by far the most common form of pneumonia diagnosed in our laboratory. The clinical signs of dyspnea, pyrexia, anorexia, coughing and the presence of a mucopurulent exudate are familiar to all bovine practitioners. These clinical signs are also present during pure viral pneumonia and verminous pneumonia. A post-mortem examination is not complete until the major bronchi and bronchioles are exposed and the exudate is expressed from the small bronchioles. The degree of inflammation in the mucosa of the respiratory system, the character of the exudate and the texture of the pulmonary tissue are the indicators of the etiology.

Recognized veterinary texts agree that pneumonic pasteurellosis has a stress factor or viral infection as the predisposing factor. Fatigue, deleterious environmental changes have been reported to cause a devitalization of the respiratory epithelium predisposing animals to the infection.

Infectious bovine rhinotracheitis, verminous

pneumonia and atypical interstitial pneumonia may be misdiagnosed as pneumonia pasteurellosis. A comparison of the clinical signs and gross lesions for each will now be presented.

## *Pneumonic Pasteurellosis:*

*Clinical signs:* Sudden onset of high fever from 104 to 106 degrees F., depression, anorexia, dyspnea and slight mucopurulent exudate. Morbidity rates vary but average about 40% and mortality rates usually range from 3 to 7%. Crowding hastens the spread of infection.

*Gross lesions:* Pneumonic pasteurellosis is manifested by marked hepatization of a third or more of the lungs. The lobes most frequently affected are the apical and cardiac lobes. Bronchitis is widespread, and the bronchi are filled with a seromucous or mucopurulent exudate which often blocks them.

*Histopathology:* The changes are classified as a fibrinous pneumonia in the various stages of congestion or red hepatization. The alveoli may contain fibrin or usually a mixture of fibrin and purulent exudate. Small bronchi contain a purulent exudate and desquamated epithelial cells.

## *Infectious Bovine Rhinotracheitis:*

*Clinical signs:* Sudden onset of severe signs including anorexia, fever (up to 108 degrees F.), severe hyperemia of the nasal mucosa with a serous discharge from the eyes and nose and increased salivation.

*Gross lesions:* The muzzle is covered with crust. An uncomplicated case is characterized by serous rhinitis with hyperemia of the tracheal mucosa. Petechial hemorrhages are evident in the mucosa of the nasal sinus. Pseudomembranes develop on the larynx and upper portion of the trachea. In uncomplicated cases the lesions are limited to the trachea and infection of the lungs does occur following complication by bacterial infection resulting in a mild anterior bronchopneumonia. Fulminating forms of the disease may result in death within 24 hours of the onset and the lesions are similar to acute pasteurellosis.

*Histopathology:* Severe necrotizing bronchitis and debris occluding the airways. Inclusion bodies may be demonstrated in the tracheal and bronchial mucosa during the early phase of the disease.

Table 1  
Differentiation of Four Types of Bovine Pneumonia

|                                 | Clinical Signs |                        |          |                        |                       |                     |                         |           | Diagnostic Aids |
|---------------------------------|----------------|------------------------|----------|------------------------|-----------------------|---------------------|-------------------------|-----------|-----------------|
|                                 | Fever          | Coughing               | Anorexia | Environment            | Discharges            | Dyspnea             | Age                     | Mortality |                 |
| Pasteurellosis                  | 106°F          | Some                   | Yes      | Stress factor          | Mucopurulent Nasal    | Yes                 | All ages, usually young | 7%        | Leukocytosis    |
| IBR                             | 104°F          | Much rasping           | Yes      | Crowding enhances      | Serous Ocular Nasal   | Mild                | Usually young           | 5%        | Virus isolation |
| Verminous Pneumonia             | 105°F          | Deep and constant Soft | No       | Follows pasture change | Slight serous & nasal | Abdominal breathing | Calves                  | 20%       | Necropsy Fecal  |
| Atypical Interstitial Pneumonia | 103°F          | Seldom                 | No       | Follows pasture change | Foamy mouth           | Expiratory grunt    | Adults                  | 30%       | Auscultation    |

Table 2  
Differentiation of Four Types of Bovine Pneumonia

|                                 | Gross and Microscopic Lesions |                                   |                      |                                    |                      |   |
|---------------------------------|-------------------------------|-----------------------------------|----------------------|------------------------------------|----------------------|---|
|                                 | Muzzle                        | Trachea                           | Bronchi              | Lobes Affected                     | Type Gross Lesion    | Microscopic Lesions                               |
| Pasteurellosis                  | Mucopurulent Nasal exudate    | Inflamed and mucopurulent exudate | Exudate and necrosis | Ventral                            | Red hepatization     | Suppurative Fibrinous                             |
| IBR                             | Crusty                        | Inflamed and edematous            | No lesion            | Cranial                            | Trachea inflammation | Tracheitis and bronchitis                         |
| Verminous Pneumonia             | Serous nasal discharge        | Froth                             | Nematodes            | All patchy caudal                  | Wedge-shaped         | Edema and eosinophilic infiltrate                 |
| Atypical Interstitial Pneumonia | Froth from mouth              | Froth                             | Froth                | Ventral atelectasis Others marbled | Voluminous lungs     | Noninflammatory, epithelialization and transudate |

### Verminous Pneumonia:

**Clinical signs:** The disease is almost entirely confined to pastured calves and particularly those that have been purchased and allowed to forage on pasture contaminated with high numbers of third-stage larvae. The first sign is diarrhea. Rapid shallow breathing is the next noticed clinical sign. Coughing persists day and night. The disease progresses rapidly, but the calves usually continue to eat. During the deep coughing phase the animals frequently have fever up to 105 degrees F. Even though secondary infection with bacteria such as *pasteurella* or streptococci complicate the disease, antibiotic therapy fails to yield favorable results. The fever persists until the animals become recumbent and die with cyanotic membranes. The mortality rate may be as high as 70% but 15 to 20% is usually expected.

**Gross lesions:** By the tenth day following exposure the larvae can be found in the lumens of the bronchioles. Prior to this, the lymph nodes are

swollen and close examination of the parenchyma of the lung will reveal firm small nodules throughout the diaphragmatic lobes. Post-mortem examination reveals mature thread-like worms in the major bronchi bathed in copious mucinous, frothy exudate. The distal fourth of the trachea is sometimes covered with patches of a pseudofibrino hemorrhagic membrane. Many times the lungs fail to collapse. Classical cases result in large wedge-shaped zones of grey or dark red tissue at the posterior border of the diaphragmatic lobes.

**Histopathology:** Histologic examination reveal atelectasis and emphysema adjacent to the severe bronchitis. Sections of larvae or ova are found in the lumen. Giant cells are frequently found in the alveoli. The walls of the alveoli are thickened by fibroplasia.

Edema, eosinophilic infiltration, dilation of lymphatics and filling of alveoli or bronchioles with degenerate leucocytes are key histologic features.

### *Atypical Bovine Pneumonia*

**Clinical signs:** The high incidence of the disease in early fall when many legumes and other pasture plants are in flower suggests that the inhalation of pollen may cause an allergic response of the alveolar epithelium. The history for three to four cases diagnosed at our laboratory include the statement that the animals have changed pastures within the past 10 days. Research completed by workers at Tifton, Georgia, indicated that ingestion of moldy sweet potatoes would cause the disease.

**Occurrence:** Most common is adult cows, particularly those which have recently calved.

In the acute form the onset is rapid. Several deaths may occur within a three-day period.

Onset is rapid, and the first clinical signs is severe dyspnea, often with grunting. Mouth breathing is an obvious clinical sign. Coughing is not frequent. The rectal temperature varies from 101 degrees F. to 104 degrees F. Auscultation reveals the absence of sound over the dorsal portion of the lungs and after two to three days of suffering the destructive rub and dry rales characteristic of interstitial emphysema becomes apparent and of diagnostic significance. Severely affected animals die on the second and third day following the onset of severe clinical signs.

### *Atypical Interstitial Pneumonia*

**Gross lesions:** The lungs do not collapse on cutting. The pleura is thickened. In usual cases the cut surface of the lung has a marbled appearance. The only functional tissue found in necropsy specimens is in the dorsal portion of the diaphragmatic lobes. The marbled affected portions are a mixture of firm dark red tissue surrounded by regions of alveolar emphysema. The ventral apical lobes have the texture and appearance of thymus tissue. Interlobular edema is a common finding. The bronchi invariably contain froth.

**Microscopic lesions:** The absence of inflammation is a key to the diagnosis. The presence of a homogenous pink fluid in the affected regions is a common histologic finding. Epithelialization of the alveolar walls and interstitial pneumonia surrounded by alveolar emphysema are also findings of diagnostic significance.

### **Discussion**

Pyrexia and dyspnea are clinical signs common to all four types of bovine pneumonia described above. Table 1 summarizes a comparison of the clinical signs and offers some differential features to aid in determining a diagnosis. Table 2 summarizes a comparison of the gross and microscopic lesions for all four diseases. A thorough physical examination and a review of environmental factors will aid in determining a diagnosis. Virus isolation attempts, complete blood counts, and fecal examinations are of value in determining the diagnosis. Gross examinations and histologic examinations will offer distinctive evidence leading to the diagnosis.

### **Summary**

The clinical signs, gross lesions and histologic similarities or differences between pneumonic pasteurellosis, infectious bovine rhinotracheitis, verminous pneumonia and atypical interstitial pneumonia were described. Thorough differentiation will permit the determination of an accurate diagnosis. An evaluation of the clinical signs and gross lesions will provide a sound tentative differential diagnosis to be used in the determination of effective therapy. Laboratory examinations are required to confirm or refute the tentative diagnosis.

### **References**

Blood, D. C., and J. A. Henderson. *Veterinary Medicine*, 2nd ed. Baltimore: The Williams and Wilkins Co., 1963. - Cohrs, Paul. *Textbook of the Special Pathological Anatomy of Domestic Animals*, 1st ed. London: Pergamon Press, 1967. - Jubb, K. V. F., and Peter C. Kennedy. *Pathology of Domestic Animals*. Vol. I, 2nd ed. New York and London: Academic Press, 1970.

### **Questions**

1. The most common gross lesion noted during pneumonic pasteurellosis is \_\_\_\_\_.
2. Differentiate the cough of calves suffering IBR from the cough of calves suffering verminous pneumonia.
3. How many days lapse between exposure to pastures heavily contaminated with lungworm ova and the appearance of clinical signs?
4. Atypical interstitial pneumonia occurs more frequently in mature cows than in calves. True or False.
5. A management factor common to verminous pneumonia and atypical interstitial pneumonia is \_\_\_\_\_.