

# Update on Interstitial Pneumonia



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## KEYWORDS

• Equine • Respiratory • Pulmonary fibrosis • Inflammation • Toxin

## KEY POINTS

- Interstitial pneumonia represents a group of acute and chronic inflammatory respiratory diseases that have the potential to cause marked alveolar damage and impairment of gas exchange within the lung in horses of all ages.
- Equine multinodular pulmonary fibrosis and acute lung injury/acute respiratory distress are recognized as specific categories of interstitial pneumonia.
- Treatment of interstitial pneumonia is often unrewarding. Therapy should include suppression of inflammation, maintenance of tissue oxygen delivery, and appropriate treatment of any underlying diseases.

The term interstitial pneumonia defines several diseases that can be acute, such as in acute lung injury (ALI)/ acute respiratory distress syndrome (ARDS), and become chronic, or be chronic and progress to pulmonary fibrosis. The course of most interstitial pneumonias is insidious with both acute and chronic forms ultimately characterized by alveolar structural derangements that lead to loss of functional gas exchange units and altered mechanical properties of the lung, characterizing these pneumonias as restrictive lung problems. Although interstitial pneumonia is an uncommon cause of acute or chronic disorders of the lower respiratory tract of horses, because of its severity, recognition and diagnosis are desirable as early as possible in its clinical course.<sup>1–8</sup>

## GENERAL CLINICAL SIGNS

Horses affected with interstitial pneumonia frequently have cough, weight loss, nasal discharge, exercise intolerance, severe dyspnea, cyanosis, and a restrictive breathing pattern. Fever is variable and dependent on the causative agent and the chronicity of disease. A so-called heave line is frequently present; nostril flare and an anxious expression are usual. The history can be acute or chronic, and horses and foals

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may be evaluated several times and treated for a variety of conditions before a diagnosis related to interstitial pneumonia is made. Affected foals are frequently depressed and anorectic, whereas adults may be bright and alert with a variable appetite. More than one foal at a farm may be affected. The disease may progress despite treatment, with progressive respiratory compromise, although some patients may also slowly improve with time and treatment.

### **PATHOPHYSIOLOGY**

Interstitial pneumonia progresses through 4 phases. During the first phase, the initial insult causes parenchymal injury and alveolitis. This stage is followed by a proliferative phase characterized by cellular and parenchymal alterations in the tissues of the lung. Chronic cases progress to the development of interstitial fibrosis, and the final stage results in end-stage irreparable fibrosis of the lung.

The structural changes that occur in the lung reduce the number of functional alveoli, adversely affecting ventilation by altering ventilation-perfusion relationships, reducing surface area available for gas exchange, and increasing diffusion barrier thickness. Reduced lung compliance is associated with the loss of distensible alveoli, the presence of pulmonary edema, and fibrosis. Total and vital lung capacities are decreased in association with the loss of functional gas exchange units and reduced lung compliance. The work of breathing is increased, resulting in exercise intolerance and difficulty in breathing. Pulmonary hypertension and cor pulmonale may be complications of interstitial pneumonia, fibrosis, and hypoxemia/hypoxia. Although the origin of pulmonary hypertension is unclear, hypoxic vasoconstriction and generation of vasoactive compounds (such as endothelin-1) that alter pulmonary vascular resistance acutely and vessel anatomy chronically may play a role.

### **DIAGNOSTIC TESTING**

In older horses, the primary differential diagnosis of heaves may be excluded by the leukocytosis and hyperfibrinogenemia that commonly occur in horses with interstitial pneumonia and fibrosis but do not generally occur in horses with heaves. However, these clinical abnormalities are common in horses with bacterial bronchopneumonia, which is another early differential diagnosis.

Thoracic imaging, both radiography and ultrasonography, are helpful and important in the establishment of a definitive diagnosis. Computed tomography (CT) is possible in neonatal foals because of their smaller size (**Fig. 1**).<sup>9,10</sup> Typically, thoracic radiographs reveal extensive interstitial and bronchointerstitial pulmonary patterns.<sup>11</sup> Nodular infiltrates may be present, either large or miliary, but are always diffusely distributed (**Fig. 2**).

Bacterial and fungal culture and viral isolation of transtracheal or bronchoalveolar lavage (BAL) aspirates often yield no significant growth of known or common pathogens. Cytologic evaluation of tracheal or BAL fluid (BALF) generally shows increased numbers of neutrophils and macrophages (**Fig. 3**). If *Pneumocystis carinii* is involved, BALF may reveal trophozoites or intracystic bodies with special stains, such as toluidine blue or methenamine silver.<sup>12</sup> Using polymerase chain reaction (PCR), equine herpes virus (EHV)-5 has been found in BALF from horses with equine multinodular pulmonary fibrosis (EMPF).<sup>13</sup>

Histologic examination of a transthoracic lung tissue biopsy specimen is the definitive antemortem diagnostic test for chronic interstitial pneumonia and fibrosis and for EMPF and may also be beneficial in fungal lung diseases. Care must be taken to ensure that the tissue biopsy is obtained from a representative area; ultrasonography

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