

Respiratory Disease and Pneumonia, 2018 March 6

(Unfinished Draft)

Pneumonia is an infection of one or both of the lungs caused by bacteria, viruses, fungi, or chemical irritants. Pneumonia is basically inflammation of lung tissue effecting gaseous exchange in the patient.

Upper Respiratory Disease

- Sinusitis
- Pharyngitis
- Laryngitis
- Dyptheria
- Tracheitis
- Bronchitis
- Obstructive diseases
- Gutteral pouch disease
- Laryngeal Hemiplegia

Lower Respiratory Disease

- Bronchiolitis
- Pneumonia
- Pulmonary edema due to left heart failure
- Pleural effusion
- Pneumothorax
- Chest compression due to bloat, ascites, or tumor

Types of pneumonia

1. Bronchial pneumonia

Also known as bronchopneumonia; affects the tubular structures of the respiratory tree. The anterior-ventral (A-V) areas of either lungs may be affected. By definition rhinitis, laryngitis, pharyngitis, tracheitis, bronchitis or bronchiolitis can become pneumonia when the infectious process extends to the alveoli level of the respiratory tree. Gravity results in the migration of infectious material into the A-V areas of the lungs. The Bronchial descriptive term reflects the route of viral or bacterial access to the lung.

Most often bronchial pneumonia occurs in a lobar pattern affecting one or more sections, or lobes of the lungs. In quadruped animals the A-V lobes are the areas that are first affected due to proximity to the upper respiratory tract and the effects of gravity on exudate. But much larger areas of the lungs can become involved as the infectious materials fill the lungs in untreated or neglected cases. Occasionally bronchopneumonia can initially affect the lungs diffusely as a result of inhalation of fine particulates. The most common example if diffuse bronchopneumonia is dust pneumonia.

Dyspnea results from interference with normal oxygenation of venous blood and excretion of carbon dioxide waste gas. Filling of the bronchioles and alveoli with exudate results in loss of normal gas exchange in the effected lung tissue. As bronchioles and alveoli fill with inflammatory exudate the lung becomes wet, heavier, and firmer than normal, and is referred to as "pulmonary consolidation". Consolidation is sometimes referred to by pathologists as "hepatization". Hepatization means that the lung feels firm like liver, instead of being soft and compressible. This is caused by replacement of air in the terminal bronchioles and alveoli with exudate. Lung consolidation can take two forms depending on the chronicity of the infection.

- Red Hepatization occurs in acute pneumonia. Acute inflammation causes edema, vascular congestion and filling of the alveoli and terminal bronchioles with exudate; including blood and serum. The acute inflammatory state imparts a red appearance to the areas with pneumonia.
- Grey Hepatization occurs in chronic pneumonia and is the result of infiltration of inflamed areas of lungs with leukocytes. Areas that are affected with gray hepatization can progress to pulmonary abscessation if there is still active infection.

The respiratory signs, or dyspnea, caused by bronchial pneumonia is variable depending on the percentage of lung that is affected. With early pneumonia affecting less than 10% of the lung there may be minimal dyspnea. As the percentage of affected lung increases, the dyspnea can progress to severe inspiratory distress.

2. Pleural Pneumonia

Is also sometimes referred to as Fibrinous Pneumonia in large animal veterinary medicine. Pleural pneumonia is a secondary pleuritis resulting from the extension of an infectious process from the lung, through the visceral pleura, into the pleural cavity. The pleuritis will result from the same micro-organism that is causing the pulmonary pathology. Inflammation and damage to the pleural surface will result in accumulation of excessive amounts of exudative pleural fluid (pleural effusion), and the deposition of variable amounts of fibrin on pleural surfaces. Often large masses or sheets of fibrin may accumulate in the pleural cavity.

Bacterial fibrinous pleuritis can also develop secondary to thoracic trauma, fractured ribs, hemorrhage or penetrating chest wounds. Tuber, non

Animals with pleuropneumonia are usually depressed, and anorexic due to fever and dyspnea. The animal may experience respiratory pain resulting in rapid shallow breathing characteristic of restrictive dyspnea. Thoracic pain also causes the animal to stand with its elbows abducted. There is often a reluctance to move and a stiff gait. Hypoxia and cyanosis become evident as the effusion results in lungs collapse. Auscultation reveals tachycardia, decreased air movement sounds ventrally. A friction rubs and crackling sounds may be auscultated dorsally. Signs of bronchopneumonia; such as coughing, nasal discharge, and purulent lacrimation may also be seen.

Treatment includes thoracocentesis with drainage of the pleural cavity in addition to antibiotics, non-steroidal anti-inflammatory drugs and other bronchopneumonia therapy. If not treated; the fluids and fibrin will compress the lungs, preventing normal lung expansion and respiratory function. The affected animal may die as a result of asphyxia.

Contagious bovine pleuropneumonia (CBPP) is caused by: *Mycoplasma mycoides mycoides*. CBPP is a reportable foreign animal disease that is not currently present in the US. *Mycoplasma bovis* is a similar endemic species of *Mycoplasma* that causes widespread disease in U.S. cattle. When signs and postmortem findings, similar to that described above, are seen; diagnostic tests should include aerobic and anaerobic culture, and a *Mycoplasma* sp. culture should also be included in the culture request.

3. Interstitial Pneumonia

Interstitial pneumonia (IP) is a type of pneumonia that is primarily inflammation of lung interstitial tissue, instead of respiratory epithelial tissue. The route of access to the lung may be via the respiratory tree, or it may be hematogenous. Common causes of IP are influenza viruses (PI3 and BRSV virus in cattle), food allergies, food origin toxins and respiratory toxins.

- In cattle overconsumption of L-tryptophan, an amino acid, which may be converted by ruminal microbes into 3-methyl indole (3MI). 3MI is a respiratory toxin that is the cause of an IP condition referred to as "Atypical Interstitial Pneumonia" (AIP).
- Moldy feeds can cause allergic conditions which present as an interstitial pneumonia.
- Horses exposed to high protein feeds, such as alfalfa, or moldy feeds may develop a pulmonary allergic interstitial inflammatory condition called "Heaves".

Toxic gas inhalation, such as Nitrogen dioxide; produced by fermenting silage, can cause "Silo Filler's Disease" in humans. Nitrogen dioxide is a colorless odorless gas capable of causing pulmonary edema with symptoms typical of IP. If left untreated it can lead to pulmonary scarring referred to as "bronchiolitis fibrosa obliterans". Cattle or other livestock housed in buildings adjacent to fermenting silage can also be affected by nitrogen dioxide.

Hydrogen Sulfide (H₂S) emission from oil wells have been reported to cause respiratory disease such as pulmonary edema. A common effect of exposure to levels above 100 ppm is suppression of the cytochrome oxidase aerobic pathway which produces ATP via aerobic metabolism. This is the cause of lethal H₂S intoxication in humans, cattle and horses in the vicinity of toxic oil or gas wells.

4. Etiologic Agents

- Viruses
- Bacteria
- Mycoplasma
- Fungi
- Toxins
- Gases
- Allergens

5. Symptoms of pneumonia

The observable symptoms of pneumonia include:

- Fever
- Depression, apprehension and decreased mentation
- Weakness
- Rapid respiration that worsens with activity
- Loss of appetite
- Restrictive or inspiratory dyspnea, with rapid respiration rates, is typical of bronchopneumonia, pleuropneumonia, pneumothorax and pleural effusion
- Expiratory Dyspnea is typical with interstitial pneumonia
- Serous nasal discharge is typical of early non-complicated viral infection
- Purulent or cloudy nasal discharge is suggestive of primary or secondary bacterial respiratory tract infection
- Hypoxia which causes open mouth breathing and pale or bluish mucous membranes occurs when oxygenation is impaired, usually in advanced disease conditions
- Rapid pulse
- Coughing is a rare symptom in cattle but a frequent symptom in horses

Symptoms of pneumonia caused by viruses are very similar to bacterial pneumonia. Note the characteristics of the nasal discharge for a clue to the microbial origin.

Mycoplasma pneumonia has a somewhat different and variable set of symptoms. Cattle infected with Mycoplasma bovis may be affected by a mild fever, depression, upper respiratory symptoms or pneumonia with a cough and mucoid expectoration, pleuritis, peritonitis, otitis externa, lameness due to mycoplasma arthritis and other syndromes.