**Diseases of the Respiratory System**

**PULMONARY EMPHYSEMA**

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**Pulmonary emphysema is distension of the lung caused by over distension of alveoli with rupture of alveolar walls with or without escape of air into the interstitial spaces.**

**Overinflation describes the situation in which there is enlargement of airspaces without tissue destruction.**

**Pulmonary emphysema is always secondary to some primary lesion which effectively traps an excessive amount of air in the alveoli. It is a common clinico-pathological finding in many diseases of the lungs of all species and is characterized clinically by dyspnea, hyperpnea, poor exercise tolerance and forced expiration.**

**ETIOLOGY  
-Pulmonary emphysema is an important lesion only in cattle. The bovine lung is highly susceptible to the development of emphysema from many different causes, not all of them respiratory in origin.  
- In those of respiratory origin it is common to find pulmonary emphysema when the primary lesion in the lung causes trapping of air in alveoli or terminal bronchioles.  
- Endotoxemia, for example, can result in diffuse alveolar damage associated with thromboangiitis resulting in pulmonary edema and emphysema. Some causes of emphysema are as follows:**

**Cattle  
- Acute interstitial pneumonia  
- Parasitic pneumonia with pulmonary edema in acute anaphylaxis  
- Perforation of the lung by foreign body as in traumatic reticuloperitonitis  
- Poisoning by the plants *Senecio quadridentatus*, rape, *Zieria arboresccns*, *Perilla frutesccl*1s and the fungus *Periconia* spp. are recorded as causing pulmonary emphysema in cattle  
- Pulmonary abscess.  
Horses  
- Bronchiolitis due to viral infection of the respiratory tract in young horses.**

**All species  
- Secondary to bronchopneum.onia  
- Poisoning by oleander, *Bryophyllu pinnatum* and moldy sweet potatoes.  
- Acute chemical injury - as in inhalation of welding fumes.   
- Chlorine gas poisoning.  
- Local or perifocal emphysema is also a common necropsy finding around local pulmonary lesions, especially atelectasis, often with no respiratory dysfunction. In calves and pigs the emphysema is sometimes sufficiently  
extensive to kill the animal.**

**PATHOGENESIS  
- Emphysema occurs because of destruction of the connective tissues of the lung, including the supporting and elastic tissue of the pulmonary parenchyma.  
- Tissue damage resulting in emphysemain humans is caused by the action of proteases in the lung. Whether this occurs in the farm animal species is unknown but is a consideration.   
- An initial lesion probably leads to an area of weakness from which emphysema spreads during coughing or exertion.   
- In interstitial emphysema there is the additional factor of distension of the connective tissue with air and compression collapse of the alveoli.**

**- The development of interstitial emphysema depends largely upon the amount of interstitial tissue that is present and is most common in cattle and pigs.   
- Whether there is simple over distension of alveoli or whether their walls are also ruptured is very important in prognosis and treatment.   
- Excellent recoveries occur in simple alveolar emphysema, especially those occurring acutely at pasture.   
-This suggests that the lesion is functional and that the  
alveoli are not substantially damaged.  
-The pathophysiological consequences of emphysema depend upon the inefficiency of evacuation of pulmonary air-space and failure of normal gaseous exchange in the lungs.**

**- Interference with the pulmonary circulation results from collapse of much of the alveolar wall area and a consequent diminution of the capillary bed.  
- The decreased negative pressure in the chest and the abnormally wide respiratory excursion also cause a general restriction of the rate of blood flow into the thorax  
- The combined effect of these factors may be sufficient to cause failure of the right ventricle especially if there is a primary defect of the myocardium.   
- Acidosis may also result because of the retention of carbon dioxide.**

**CLINICAL FINDINGS  
- Characteristically, emphysema diffuse severe pulmonary  
expiratory causes dyspnea with a grunt on expiration and  
loud crackling lung sounds on auscultation over the emphysematous lungs .  
- In severe cases in cattle, the emphysema is commonly interstitial and dissection of the mediastinum and fascial planes results in subcutaneous emphysema over the withers.   
- In severe cases in cattle, open­mouth breathing is common.  
- In cattle and pigs the presence of pulmonary emphysema in pulmonary disease is often not detectable clinically.**

**CLINICAL PATHOLOGY  
- There is hypoxemia and, often, hypercapnia. Compensatory polycythemia may develop.  
- There are no characteristic hematological findings but, if there is a significant secondary bronchopneumonia, a leukocytosis and left shift may be evident.  
- In the appropriate location, an examination of feces for lungworm larvae may be desirable.  
- In cases suspected of having an allergic origin, swabs of nasal secretion may reveal a high proportion of eosinophils and a hematological examination may show eosinophilia.**

**NECROPSY FINDINGS  
- The lungs are distended and pale in color and may bear imprints of the ribs.   
- In interstitial emphysema the interalveolar septae are distended with air, which may spread to beneath the pleura, to the mediastinum and under the parietal pleura. - There may be evidence of congestive heart failure.   
- On histopathological examination a bronchiolitis is present in most cases.  
- This may be diffuse and apparently primary or originate by spread from a nearby pneumonia.**

**D. D.** -**Acute emphysema in cattle- is often accompanied by pulmonary edema with the presence of consolidation and crackles in the ventral parts of the lungs. It may be similar to acute pulmonary congestion and edema caused by anaphylaxis but forced expiration is not a cha racteristic of these latter conditions.  
- Acute pneumonia in cattle or horses is characterized by fever and localization of abnormal respiratory sounds, which are not as marked nor as widely distributed as those of emphysema.  
 -Chronic pneumonia is characterized by dyspnea, chronic toxemia,crackles and wheezes and poor response to therapy.  
-Pneumothorax is accompanied by forced inspiration and an absence of normal breath sounds.**

**TREATMENT  
- The treatment of pulmonary emphysema will depend on the species affected, the cause of the emphysema and the stage of the disease.  
- There is no known specific treatment for the pulmonary emphysema associated with acute interstitial pneumonia in cattle, which is discussed under that heading.  
- The emphysema secondary to the infectious pneumonias will usually resolve spontaneously if the primary lesion of the lung is treated effectively.   
- In valuable animals, the administration of oxygen may be warranted if the hypoxia is severe and life threatening.**

**- Antihistamines, atropine and corticosteroids have been  
used for the treatment of pulmonary emphysema  
secondary to interstitial pneumonia in cattle but their efficacy has been difficult to evaluate.**

**References**

**O. M. Radostits, C.C.Gay, K. W. Hinchcliff, and**  **P. D. Constable ( 2011 ): VETERINARY MEDICINE**

**A textbook of the diseases of cattle, horses, sheep, pigs and goats,10thedition. Publisher SAUNDERS. www.elsevierhealth.com**