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**Shubhangi Argade**

Department of Veterinary  
Pathology, College of Veterinary  
Science & A.H., Anjora, Durg,  
Chhattisgarh, India

**Poornima Gumasta**

Department of Veterinary  
Pathology, College of Veterinary  
Science & A.H., Anjora, Durg,  
Chhattisgarh, India

**Shailesh Kumar Patel**

Department of Veterinary  
Pathology, College of Veterinary  
Science & A.H., Anjora, Durg,  
Chhattisgarh, India

**DK Jolhe**

Department of Veterinary  
Pathology, College of Veterinary  
Science & A.H., Anjora, Durg,  
Chhattisgarh, India

**Megha Katare Pandey**

Department of Veterinary  
Pathology, College of Veterinary  
Science & A.H., Anjora, Durg,  
Chhattisgarh, India

**Anish Kumar Sonwani**

Department of Veterinary  
Pathology, College of Veterinary  
Science & A.H., Anjora, Durg,  
Chhattisgarh, India

**Renu Khesh**

Department of Veterinary  
Pathology, College of Veterinary  
Science & A.H., Anjora, Durg,  
Chhattisgarh, India

**Correspondence**

**Shubhangi Argade**

Department of Veterinary  
Pathology, College of Veterinary  
Science & A.H., Anjora, Durg,  
Chhattisgarh, India

## Pathology of pulmonary emphysema in Murrah buffalo

**Shubhangi Argade, Poornima Gumasta, Shailesh Kumar Patel, DK Jolhe, Megha Katare Pandey, Anish Kumar Sonwani and Renu Khesh**

### Abstract

An adult Murrah buffalo bull presented for the post-mortem examination to the department of Veterinary Pathology, College of Veterinary Science & A.H., Anjora, Durg, Chhattisgarh. Animal had the history of respiratory distress characterized by nasal discharge and laboured breathing. On external examination, the animal showed pale mucous membranes and rough hair coat. Upon necropsy peritoneum and endocardium exhibited fibrinous deposition along with congested liver and kidney. Lungs of the animal were severely congested and emphysematous, filled with numerous small sized air bubbles, making it unable to collapse. Histopathological examination revealed haemorrhage and congestion in the liver and kidneys. Microscopic changes in lungs were predominated and suggestive of emphysema characterized by enlargement of airspaces, destruction of alveolar walls and loss of alveolar unit. Pulmonary emphysema is an important pathological condition in buffaloes mostly occurs as a result of lung diseases of various causes, may lead to severe respiratory distress followed by respiratory failure and death of the animal.

**Keywords:** Murrah buffalo, emphysema, gross pathology, histopathology

### Introduction

Emphysema is an important condition in animals and it mostly occurs as a result of another lung disease. The condition leads to difficulty in expelling air from lungs, making respiration difficult. The two major forms of emphysema are generally present. One is alveolar emphysema which is abnormal permanent enlargement and destruction of alveoli, another one is interstitial emphysema which is characterised by the presence of air within the supportive connective tissue of lung. Historically bovine emphysema has been directly associated with acute bovine pulmonary emphysema or fog fever [1, 2, 3].

The capacity of respiratory exchange is already limited in bovine compared to other species due to relatively small total alveolar surface area and lesser density of capillaries. A larger part of the lung capacity in the bovine is required for basic needs leaving little lung reserve available in stressful circumstances. Bovine lung is distinguished by very thick connective tissue septa that separate areas on the surface and extend inward to divide the lung into segments. The septa may help to localise infection and turned to thickened and oedematous. This may cause obstruction of airways on expiration which leads to an imbalance where the volume of air entering exceeds the volume of air leaving the lung and ultimately leads to emphysema [4, 5]. Emphysema interferes with respiratory function because of parenchymal destruction and changes in the mechanism of respiration [6]. In the present study a case of emphysema in buffalo has been reported.

### Materials and Methods

A male buffalo was presented for the post-mortem examination to the Department of Veterinary Science & A.H., Anjora, Durg, Chhattisgarh. The detailed post mortem examination was carried out and all the gross pathological changes were recorded carefully. Representative samples were collected from the lungs, liver, kidneys and heart fixed in 10% buffered formalin for microscopic examination.

Collected samples were processed for histopathological examination. Formalin fixed samples were trimmed upto 5mm, washed with water overnight followed by dehydration and clearing by using acetone and benzene respectively. These samples were subjected for wax impregnation and section cutting at 4-5 $\mu$ .

Tissue sections were taken into the slides and stained with hematoxylin and eosin staining protocol.

For staining firstly we removed wax from the slides by giving 2 changes in xylene for 10 minutes each. After this, slides putted into the descending series of ethyl alcohol for 2 minutes each. Then slides stained with hematoxylin and eosin stain. Following staining slides again exposed to ethyl alcohol, but this time with the ascending series, which was ended in absolute alcohol. Finally we given two changes of xylene and mounted the tissue in slide permanently by using DPX mounting media [7].

### Results and Discussion

The clinical history taken from the farm manager revealed that animal was dull, depressed, and lethargic, had nasal discharge and sometimes showed laboured breathing. Upon external examination body condition of the animal was quite normal, nasal discharge was present along with pale conjunctiva. Post mortem examination showed lesions in various organs with the major pathology seen in the lungs.

Upon gross examination, fibrinous exudate was found on abdominal viscera. In abdominal cavity around two litres of serous fluid was found which is suggestive of hydroperitoneum (Figure 1). Liver of the animal was enlarged with rounded borders and had fatty changes. Heart showed hydropericardium (Figure 2) along with deposition of fibrinous exudates. Kidneys were found haemorrhagic along with necrotic foci. Major finding in lungs of the animal was emphysema. Lungs were heavily filled with the numerous small to large sized gas bubbles (Figure 3) making it unable to collapse. Congestion and oedema also appeared as minor but significant finding.

Microscopically, liver showed congestion, fatty changes and kupffer cell hyperplasia along with dilatation of sinusoidal space (Figure 4). Heart revealed congestion and necrotic foci. Kidneys had congestion and tubular damage along with eosinophilic cast deposition in the tubular lumen (Figure 5). Lung showed a variety of pathological lesions amongst emphysema was dominated. There was varying degree of emphysema, characterised by an enlargement of airspaces, destruction of alveolar walls, loss of alveolar unit and along with congestion, oedema and leukocyte infiltration (Figure 6). Our results are in correlation with various researchers. American Thoracic Society [8] observed pulmonary emphysema which was characterized by enlargement of airspaces distal to the terminal bronchiole, the destruction of alveolar walls, and loss of the alveolar unit.

Presence of oedema in the lungs and frothy fluid in the air passages has been previously reported by O'Donoghue, (1960) [1]. Gelatinous transudate was found in the pericardial sac. Microscopically, he observed oedema along with interstitial and alveolar emphysema of the lung. Degenerative changes of the liver and kidneys have also been reported by him [1].

Hananeh and Ismail [2] reported a case of concurrent pulmonary emphysema in cattle. They observed both the lungs were heavier than the normal and failed to collapse. Variable sized gas bubbles throughout the subpleura and interlobular fascia that extended to the mediastinum were also reported. Pulmonary parenchyma was found diffusely disrupted by abundant edema and numerous gas bubbles. They were filling more than 90% of the alveolar spaces, interlobular septa, and subpleura. The alveolar walls were moderately thickened by prominent fibromusculature,

serofibrinous edema, and a few inflammatory cells primarily neutrophils.

Muhammad *et al.* (2008) [9] reported a case of acute pulmonary emphysema cum pulmonary edema apparently associated with feeding of a particular feed in dairy buffalo. They observed that animals showed tachypnea, expiratory dyspnea and open-mouth breathing along with crackles in ventral aspects of the lungs.

**Conclusion:** In this study we described the gross and a histopathological finding of pulmonary emphysema, which is an important condition in buffaloes mostly, occurs as a result of lung diseases. Enlargement of airspaces, destruction of alveolar walls and loss of the alveolar unit may lead to severe respiratory distress resulting into respiratory failure and death of the animal.



Fig 1: Accumulation of serous fluid in the peritoneal cavity.

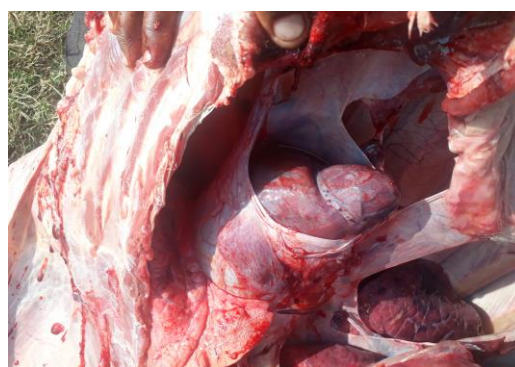
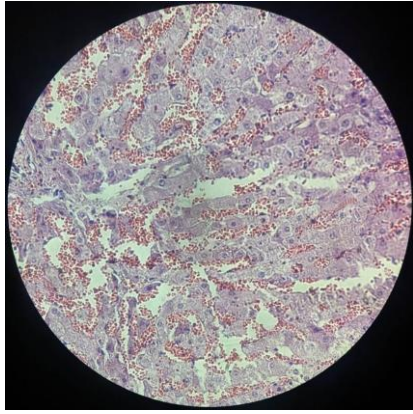


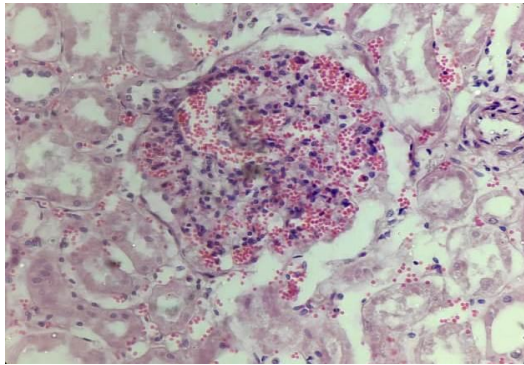
Fig 2: Heart of the animal showing hydropericardium and fibrinous exudate.



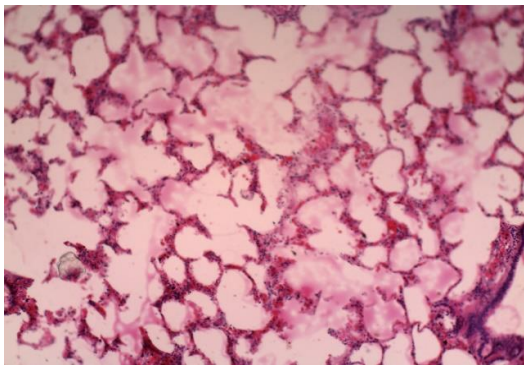
Fig 3: Lung showing congestion, oedema and emphysema.



**Fig 4:** Microphotograph of liver showing congestion. (100 X) H&E



**Fig 5:** Photomicrograph of kidney showing congested glomeruli along with mononuclear cell infiltration. (400 X) H&E



**Fig 6:** Photomicrograph of lungs is showing emphysema and oedema. (100 X) H&E

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