



Original Research

An Abattoir Based Histopathological Survey of Pulmonary Pathology in Small Ruminants

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Abstract

Considering importance in epidemiological studies, the present investigation was conducted to find out the prevalence of various pulmonary lesions in small ruminants. Out of 110000 animals under the study, two hundred and forty-seven ovine and caprine cases showed different types of pulmonary disorders including Jaagsiekte (n=23, 9.32%), Maedi (n=37, 14.98%), bronchopneumonia (n=182, 73.68%) and other miscellaneous conditions (n=5, 2.02%). The various types of bronchopneumonia observed in the present study includes chronic, serofibrinous, suppurative, interstitial and eosinophilic bronchopneumonia. The chronic bronchopneumonia (CBP) found more common in small ruminants showing extensive fibrosis of pulmonary parenchyma. In conclusion, the present study revealed bronchopneumonia as a predominant pulmonary disorder in small ruminants followed by Maedi and Jaagsiekte.

Key words: Abattoir, Bronchopneumonia, Goat, Jaagsiekte, Maedi, Pneumonia, Pathology, Sheep

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Introduction

India has the huge number of domestic animals. The country has 2nd and 5th rank in the goat and sheep production. Like in many other developing countries, livestock production in India largely depends on the traditional sector which constitutes more than 98% of the total livestock population. However, the traditional livestock keeps facing several challenges which include poor animal genetic makeup, poor management, and various diseases (Njombe and Msanga, 2009). Respiratory diseases caused by concurrent infections have been identified as the leading health problem of small ruminants which accounts for up to 54% of the overall mortality of sheep (Mukasa-Mugerwa *et al.*, 2000) involving multiple agents such as bacteria (*Pasteurella*, *Mannheimia*, *Chlamydia*, *Mycoplasma species*, etc.), virus (PPR, Para influenza-3





virus, Maedi-visna, etc.) and lungworms (*Dictyocaulus filaria* and *Muelleris capillaries*) Garedew *et al.*, 2010.

These viral pneumonias most commonly affects to lambs and kids. Chronic progressive viral pneumonia is most common in adults and includes progressive interstitial retroviral pneumonia (in sheep, maedi and jaagsiekte or the contagious lung tumor of sheep and, infrequently of goats). Chronic, progressive, proliferative changes in the lungs are usually associated with the lentiviruses (Family *Retroviridae*), or so-called slow-virus infections. In both progressive pneumonia and pulmonary adenocarcinoma, the entire lung can change in a gradual process of abnormal cellular proliferation (Manasa *et al.*, 2018). In affected sheep, the loss of functional lung tissue results in progressive dyspnoea, anorexia, and weight loss. In view of the importance of abattoir records in the epidemiology of animal diseases and to safeguard public health, the current study was aimed at investigating the prevalence of lung disease conditions in India.

Material and Methods

The study was a retrospective abattoir survey undertaken for a period from February 2013 to June 2013 (Oucheriah *et al.*, 2017). During the study period a total of 106,000 sheep and 5000 goats were inspected in the in Perambur Slaughter House, Chennai (India) for slaughter. Affected lung tissues and any abnormal growths from carcass were collected from 215 sheep and 32 goats. The data regarding the breed, sex and age of animals under study could not be collected for each slaughtered animal. It was not possible to get the exact records on the breed, sex and age for each slaughtered animal. With regards to the setup of the livestock sector in India, almost all animals sent for slaughter are the adult and come from the traditional sector. Prevalence regarding various pulmonary disorders or lesions were recorded as per standard protocol. The impression smears from lesions observed were prepared for cytopathological examination and stained by using Leishman-Giemsa stain. Tissue samples were collected in 10% neutral buffer formalin (NBF) solution. Normally lung diseases and lesions are grossly diagnosed based on pathological changes in organ colour, size, morphology, consistency, presence of lesions and parasites.

Results and Discussion

Among the 247 cases of ovine and caprine with pulmonary lesions (Table 1), 23 cases (9.32%) were found to be of Jaagsiekte, 37 cases (14.98%) Maedi, 182 cases (73.68%) bronchopneumonia and 5 cases (2.02%) miscellaneous conditions. Among the ovine pulmonary lesions, 21 (9.77%) cases were Jaagsiekte, 33 cases (15.35%) Maedi, 156 cases (72.55%) bronchopneumonia and 05 cases (2.33%) miscellaneous conditions (Table 2). Among the caprine pulmonary lesions (Table 3), 2 cases were Jaagsiekte (6.25%), 4 Maedi (12.50%) and 26 bronchopneumonia (81.25%) (Mellau *et al.*, 2010).

Table 1: Incidence of pulmonary lesions in ovine and caprine slaughter house specimens

S. No.	Type of Lesion	Number of Cases (N=247)	Percentage (%)
1	Jaagsiekte	23	9.32
2	Maedi	37	14.98
3	Pneumonia	182	73.68
4	Miscellaneous	5	2.02

Table 2: Incidence of pulmonary lesions in ovine slaughter house specimens

S. No.	Type of Lesion	Number of Cases (N=215)	Percentage (%)
1	Jaagsiekte	21	9.77
2	Maedi	33	15.35
3	Pneumonia	156	72.55
4	Miscellaneous	5	2.33

Table 3: Incidence of pulmonary lesions in caprine slaughter house specimens

S. No.	Type of Lesion	Number of Cases (N=32)	Percentage (%)
1	Jaagsiekte	2	6.25
2	Maedi	4	12.5
3	Pneumonia	26	81.25

Grossly in suppurative bronchopneumonia, single to multifocal abscesses were observed in the lung parenchyma in a few cases (Fig. 1). In the case of serofibrinous pleuropneumonia, accumulation of yellowish to white serofibrinous material over pleura was observed (Fig. 2). In chronic bronchopneumonia, right cranial lung lobe was more commonly affected when compared to the other lung lobes (cranio-ventral lobe).

**Fig. 1:** Sheep-Suppurative pneumonia- Multifocal to coalescing large abscesses with thick greenish yellow pus**Fig. 2:** Goat-Serofibrinous pleuro- pneumonia: Cranioventral lung lobe.

These changes are agreement with the descriptions of Aitkin (2007), Zachary and McGavin (2012). Microscopically pneumonia showed inflammation of the lung characterized by enlargement, hyperemia and sometimes edema. Five types of pneumonia were observed (Table 4 and 5). Cytopathologically by

Leishman-Giemsa staining chronic bronchopneumonia/ suppurative pneumonia cases showed necrotic debris, degenerated and/ or intact neutrophils and bacterial colonies besides mononuclear cells and fibroblasts.

Table 4: Gross pathological changes observed in various types of pneumonia in slaughter house specimens

S. No.	Type	Distribution	Colour	Consistency
1	Chronic bronchopneumonia	Cranioventral with atelectasis	Pale to red	Hard and granular appearance
2	Suppurative pneumonia	Cranioventral consolidation	White to yellowish suppurative raised nodules	Firm/fluid
3	Serofibrinous pleuropneumonia	Cranioventral consolidation	pale	Elastic to hard
4	Interstitial pneumonia	Diffuse	pale	Elastic
5	Eosinophilic	Multifocal	Multifocal pale to red	Nodular

Table 5: Incidence of different types of pneumonia in ovine slaughter house specimens

S. No.	Type of Pneumonia	Number of Cases	Percentage (%)
1	Chronic bronchopneumonia	114	73.07
2	Suppurative pneumonia	17	10.89
3	Serofibrinous pleuropneumonia	15	9.61
4	Interstitial pneumonia	8	5.15
5	Eosinophilic pneumonia	2	1.28

Suppurative bronchopneumonia cases showed single small to large multifocal variable sized discrete abscesses were seen. Suppurative foci revealed intact to degenerate neutrophils. Abscesses containing colonies of bacteria surrounded by neutrophils were observed (Fig. 3) (Mugale *et al.*, 2015). In the serofibrinous pleuropneumonia the pleura was thickened with the formation of fibrinous capsule (Farooq *et al.*, 2017 and Mallu *et al.*, 2017) (Fig. 4).

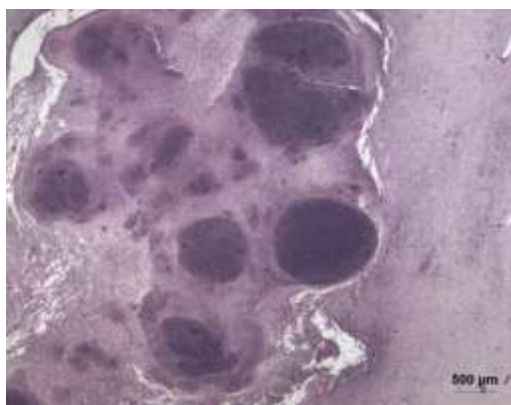


Fig. 3: Goat-Suppurative pneumonia- Multifocal abscesses. H&E Bar=500 µm

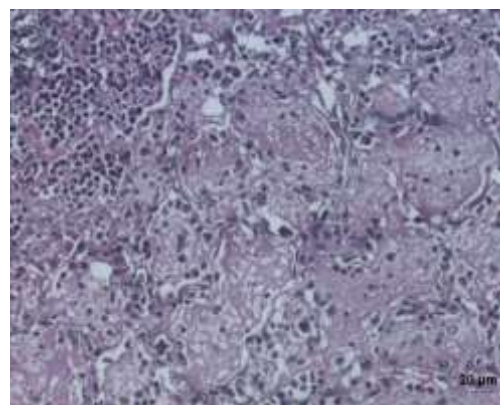


Fig. 4: Goat-CBP-Sero-fibrinous exudate in alveoli. H&E Bar=20 µm



Mostly disseminated intravascular coagulation (DIC) and serofibrinous exudates in the alveoli and of goat lung were observed in these cases. These lesions are suggestive of *Mannhaemia hemolytica* infection in sheep and goat (Aitkin, 2007 Zachary and McGavin, 2012). In the chronic bronchopneumonia cases, neutrophils and mononuclear cell infiltrations in the bronchi and alveoli with formations of fibrous connective septa were observed in the lung parenchyma. Bronchial lumen showed mucinous to mucoid basophilic exudate and goblet cells. Sometimes, lympho-plasmacytic infiltrations were found in bronchiole and alveolar lumen. Interstitial pneumonia histopathology showed thickening of alveolar walls with diffuse infiltration of mononuclear cells in lung parenchyma. Eosinophilic pneumonia showed eosinophilic and proteinous inclusions in macrophages were found. Occasionally, hyperplastic bronchiole was also found showing multiple layers of epithelial cells. Formation of corpora amylacea was seen in bronchiole and alveolar lumen. Occasionally erythrophagocytosis was observed.

In miscellaneous cases, emphysema, oedema, anthracosis (deposition of black dust materials in the lung parenchyma) and pleurisy were observed. In most abattoirs, it is standard practice to condemn diseased carcasses or organs wholly or partially, for health and aesthetic reasons (Mellau *et al.*, 2010). Animals showing no clinical signs of diseases may be detected at slaughter and the true picture of these diseases and conditions could be documented and made available to the public. Therefore, the use of meat inspection records is an easy source of data for evaluation of the epidemiological aspects of animal diseases (Schweizer *et al.*, 2003). It has been observed that pneumonia was the leading cause of lung condemnations and it accounted for 73.68% ((Mellau *et al.*, 2010). Pneumonia in ruminants is a complex condition involving interaction between the host (i.e. immunological and physiological), multiple agents (e.g. bacterial, viral, mycoplasma) and environmental factors (Brodgen *et al.*, 1998). Lung abscess may originate from infected emboli in blood coming from other septic organs/areas as in the case of endocarditis, lymphadenitis, mastitis and metritis. It is documented that *Pasteurella spp.* and *A. pyogenes* are the main causes of lung abscesses in cattle (Herenda *et al.*, 2000).

Cytopathology of pulmonary adenocarcinoma (jaagsiekte) revealed high cellularity. The acinar pattern of neoplastic cells showed pleomorphism with variable sized nuclei and nucleoli. Histopathologically alveoli were lined by cuboidal and/ or columnar epithelial cells. Proliferating cells showed papillary projections into the lumen of alveoli with the fibrovascular core. Neoplastic epithelial cells showed scarce mitotic figures and some cells revealed intracytoplasmic eosinophilic inclusion bodies in the cytoplasm (Fig. 5) (Mugale *et al.*, 2016; Pawaiya and Ram, 2007 and Tamizharasan, 2009). Maedi showed predominantly lymphocytes occurring in large sheets in cytopathology. Nuclei showed coarse chromatin and eccentric. Occasionally, plasma cells, lymphoblasts, macrophages phagocytosis by mononuclear cells and inclusion like bodies were seen in mononuclear cells. Histopathologically lymphonodular lesions commonly occurred along the course of the bronchi, bronchioles and also in the interstitial areas.

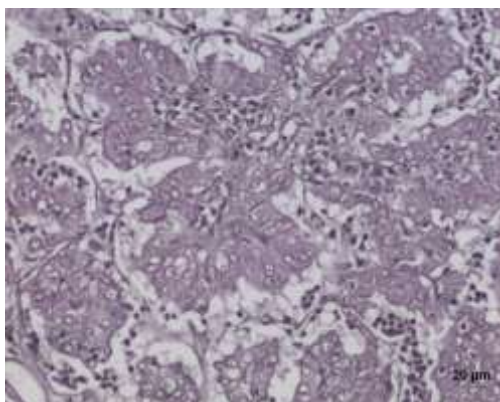


Fig. 5: Sheep-Jaagsiekte-Lung-Papillary alveolar adenocarcinoma. H&E Bar=20 µm

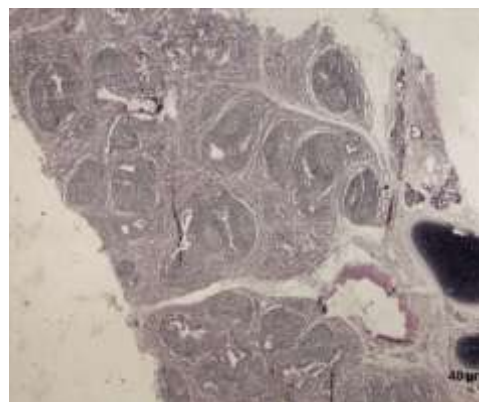


Fig. 6: Sheep-Maedi-Lung-Multifocal lymphoid aggregation. H&E Bar=40 µm

This constituted single to multiple nodules along the peribronchial area. The Germinal centre was found in the lymphoid cell and a few multinucleated giant cells (Fig. 6) (Mugale *et al.*, 2015, Banerjee and Gupta, 1979 and Tamizharasan 2009).

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