Haryana Vet. (June, 2018) **57 (1)**, 89-92

Research Article

PREVALENCE OF PNEUMONIC LESIONS IN LUNGS OF SLAUGHTERED SWINE

ANAND PRAKASH* and G. SAIKUMAR[1]
Department of Veterinary Public Health and Epidemiology
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar-125004, India
[1]Division of Pathology, Indian Veterinary Research Institute, Izatnagar-243122, India

ABSTRACT

Porcine respiratory diseases are responsible for huge economic losses to pig farmers and swine industry as a result of high morbidity, high mortality, and low feed conversion efficiency. The present work was undertaken to study the different pathological manifestations from pigs brought for slaughter to a local slaughter house at Prem Nagar in Bareilly, UP, India. A total of 95 lung tissues from pigs showing gross morphological changes were collected in 10% formalin and processed for histopathological examination. The samples were collected from September, 2005 to Februray, 2006 during autumn, winter and spring seasons. On gross and histopathological examination, pneumonia was observed in 94.73% (90/95) cases. Microscopically, the pneumonic lesions were classified into interstitial pneumonia (50.5%), lobar pneumonia (43.1%), enzootic pneumonia (4.21%) and foreign body pneumonia (1.05%). One case of parasitic pneumonia (1.05%) was observed in isolation while three cases of parasitic pneumonia were observed along with other pathological lesions.

Keywords: Slaughterhouse pigs, lungs, interstitial pneumonia, lobar, parasitic

Respiratory diseases are responsible for high morbidity, high mortality, low food conversion efficiency, and poor growth rate, which results in huge economic losses to pig farmers and pig industry (Maes *et al*., 1999). Respiratory diseases in pigs are polymicrobial in nature and are caused by combination of various primary agents and secondary opportunistic pathogens. The multifactorial nature of infection results in complex and continuously evolving disease symptoms and lesions, which are collectively termed as porcine respiratory disease complex (PRDC) (Brockmeier *et al.,* 2002). Slaughterhouse studies in pig have been used to identify potential occurrences of old or new respiratory diseases (Lium and Falk, 1991; Holt *et al.,* 2011), thus serving as an epidemiological tool to assess the disease status and forecasting of respiratory disease outbreaks. According to 19th Livestock Census of India (2012), total swine population in country is 10.29 million which has decreased by 7.54% over the previous census (Livestock Census-2012), and this decline is attributed to disease outbreaks (https://www.dailypioneer.com/nation/population-of-pigs-registers-decline-of-75.html) Lung samples collected from slaughterhouses could inform about trends in porcine respiratory diseases. Thus, the present study was undertaken to study the prevalence and pathological changes in lungs of slaughtered swine.

MATERIALS AND METHODS

A total of 95 porcine lung tissues from 95 different animals showing gross changes suspected of porcine respiratory disease complex were collected from a local slaughter house located at Prem Nagar in Bareilly, UP, India. The samples were collected from September, 2005 to February, 2006 encompassing autumn, winter and spring seasons. These samples were fixed in 10% buffered neutral formalin. Formalin fixed tissues were processed for routine histopathology and 4 micron thick paraffin sections were subjected to Haematoxylin and Eosin (H&E) staining for histopathological analysis (Luna, 1968). The stained sections were examined under light microscope and microscopic findings were recorded.

*Corresponding author: dranandprakah06@gmail.com

RESULTS AND DISCUSSION

Present study involved collection of 95 porcine lung tissue samples with gross lesions in order to study pathological changes in lungs. Microscopic observation of H& E stained sections of lung tissue revealed pneumonic changes in 95% (90/95) of lungs (**Table 1**). The prevalence of pneumonia in pigs varied from less than 5% to more than 61.71% as reported previously by various workers (Lium and Falk, 1991; Gupta, 1982; Lee *et al.*, 1999; Rao *et al.*, 2002; Lavanya *et al.*, 2011). The variation in incidence of pneumonic lesions could be due to number, breed, sex, immunity, and vaccination status of animals (Lium and Falk, 1991; Gupta, 1982; Merialdi *et al.*, 2012), weather conditions (Lee et al., 1999), stress (Brockmeier *et al.,* 2002), and management practices (Stark *et al.*, 1998). Even though we have not looked specifically at the aforementioned parameters but the variation observed in pneumonic lesions could potentially be linked to these factors.

In the present study, interstitial pneumonia was observed in 50.5% (48/95) samples. Previously, Lavanya *et al (2011),* Rao *et al (2002),* Lee *et al (1999),* and Gupta (1982), respectively reported 7.87%, 8.3%, 23.6%, and 33.6% prevalence of interstitial pneumonia. Interstitial pneumonia was further categorized into acute interstitial pneumonia (47.3%) and chronic interstitial pneumonia (3.1%). Grossly, acute interstitial pneumonic lungs were highly congested, hemorrhagic, and had areas of consolidation interspersed with emphysema. The cut surface was smooth and moist and bronchi contained moderate amount of mucoid exudate. Microscopically, mild to moderate peribronchiolar and perivascular lymphoid cell proliferation and vasculitis was also observed. Bronchiolar mucosa showed desquamation,

C

Table 1

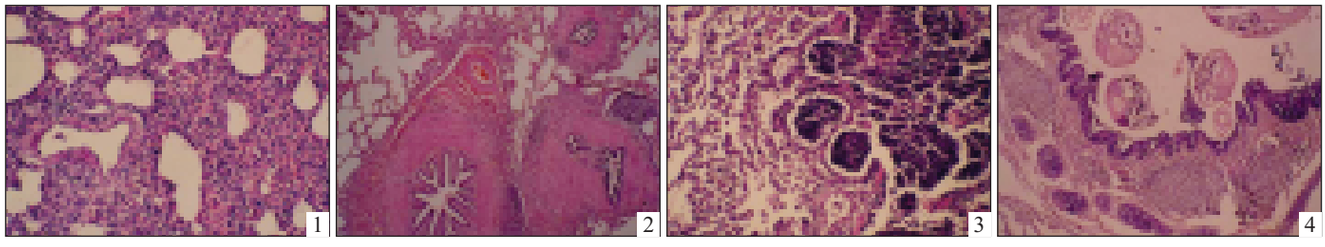
Different types of pneumonia encountered in porcine lung samples

S. No.		No. of cases	Percentage of cases (%)
A	Interstitial pneumonia		
	Acute Interstitial pneumonia	45	47.3
	Chronic Interstitial pneumonia	03	3.15
B	Enzootic pneumonia	04	4.21
C	Lobar pneumonia		
	Acute suppurative bronchopneumonia	01	1.05
	Acute non- suppurative bronchopneumonia	06	6.31
	Acute serofibrinous bronchopneumonia	15	15.78
	Acute fibrinopurulent bronchopneumonia	01	1.05
	Acute haemorrhagic pneumonia	14	14.73
D	Parasitic pneumonia		
	Metastronglyes infection	01*(04)	1.05
E	Miscellaneous conditions		
	Foreign body pneumonia	01	1.05
	Total	95	100%

denudation, and hemorrhagic lesions. Alveolar septa were infiltrated with lymphocytes and mononuclear cells along with varying degree of connective tissue proliferation **(Fig.1)**. On gross examination, lungs showing lesions suggestive of chronic interstitial pneumonia failed to collapse and had reddish grey area which gave lungs a meaty appearance. The interlobular septum was prominent & yellowish and the pleura was thickened and wrinkled. Microscopically, the lesions were characterized by bronchial smooth muscle hypertrophy, peribronchial and perivascular infiltration of lymphocytes, cellular infiltration of lymphocytes, mononuclear cells, and varying degree of fibrosis **(Fig. 2)**. These gross and microscopic findings seen in present study were in agreement with observations reported previously (Lavanya *et al.*, 2011).

Enzootic pneumonia was observed in 4.21% (4/95) cases in the present investigation. Previously, Pattanayak and Gupta (1982), Pointon and Sloane (1984) and Stark *et al.* (1998) reported prevalence of enzootic pneumonia in 15%, 45% and 65.4% cases respectively. Grossly lesions showed greyish pink bilateral hepatization of cardiac and apical lobes and cut surface was moist and appeared like lymphoid tissue. Microscopically, the marked lymphohistiocytic accumulation in the perivascular and peribronchiolar areas, varying degrees of narrowing of the lumen, bronchial and alveolar lumen with serocellular exudate and atelactasis was seen. These finding were in consonance with observations made by Pattanayak and Gupta (1982), Pointon and Sloane (1984) and Stark *et al.* (1998). These lesions are particularly associated with *Mycoplasma hypopneumoniae* in pigs (Maes *et al.*, 1996). No isolation was performed however the pneumonia was characterized as enzootic on the basis of the lesions observed in the current study.

Lobar pneumonia was observed in 43.13% (41/95) cases in the current studies. The lobar pneumonia cases were microscopically categorized into acute serofibrinous pneumonia (15/95), acute suppurative bronchopneumonia (1/95), acute non-suppurative bronchopneumonia (6/95), acute fibrinopurulent pneumonia (1/95), acute haemorrhagic pneumonia (14/95) and necrotizing pneumonia (4/95), which accounted for 15.78%, 1.05%, 6.31%, 1.05%, 14.73% and 4.21% cases respectively. Prevalence of lobar pneumonia worldwide varied from 11.98% to 81.01% cases (Lium and Falk, 1991; Lee *et al.*, 1999; Rao *et al.*, 2002; Lavanya *et al.*, 2011). Gupta (1982) observed acute serofibrinous pneumonia in 2% cases. Variation in the prevalence of acute haemorrhagic pneumonia has been previously reported with 4 % and 7.4% cases (Gupta, 1982; Singh, 1975). Lower prevalence of 1% and 2.85% of necrotizing pneumonia in comparison to current study had also been previously observed (Lavanya *et al.*, 2011; Singh, 1975). Grossly mild to moderate consolidation of lungs was observed in acute



Figs. 1-4. 1. Acute Interstitial Pneumonia. Infiltration of alveolar septa with lymphocytes and mononuclear cells along with connective tissue proliferation (H&E X100). **2.** Chronic Interstitial Pneumonia. Bronchial smooth muscle hypertrophy, peribronchial and perivascular infiltration of lymphocytes (H&E X100). **3.** Acute Suppurative Bronchopneumonia. Alveolar tissue necrosis along with neutrophilic infiltration (H&E X100). **4.** Parasitic Pneumonia. Presence of cut sections of parasite (*Metastrongylus* spp.) in bronchial lumen, luminal epithelium atrophy and desquamation, and peribronchial lymphoid tissue proliferation (H&E X100).

serofibrinous pneumonia, acute suppurative and non-suppurative bronchopneumonia. Severe congestion was seen in fibrinopurulent pneumonia and haemorrhagic pneumonia. Necrotizing pneumonia was characterized by irregular areas of necrosis. Microscopically, acute serofibrinous pneumonia was characterized by presence of serous or serofibrinous exudate with infiltration of red blood cells and few neutrophils in bronchioles and alveoli. In acute suppurative bronchopneumonia, necrosis of alveolar tissue with infiltration of neutrophils in the alveoli was observed **(Fig. 3)**. Microscopically the acute non-suppurative bronchopneumonia had infiltration of neutrophils and varying amount of cell debris, mucin, fibrin, and macrophages in bronchioles and in immediately adjacent alveoli. In acute fibrinopurlent pneumonia, fibrinopurulent exudate was seen in alveoli and bronchioles, where neutrophils were the predominantly infiltrating cells. In acute haemorrhagic pneumonia, alveoli were filled with serous exudate with varying number of erythrocytes, mononuclear cells, and neutrophils. Necrotizing pneumonia was characterized by irregular necrotic areas outlined by darkly stained basophilic bands composed mostly of lymphocytes and macrophages. Similar gross and microscopic findings of different acute pneumonia have been reported previously (Rao *et al.*, 2002; Lavanya *et al.*, 2011).

Lesions of parasitic pneumonia were observed in 4.2% (4/95) overlapping cases in present study. One case of parasitic pneumonia (1.05%) was observed in isolation while three cases of parasitic pneumonia were observed along with other pathological lesions. Parasitic pneumonia was previously observed in 2.63% cases (Rao *et al.*, 2002), 3.66% cases (Gupta, 1982) and 40.3% cases (Shima *et al.*, 2014). The variation in the incidence could be due to indoor vs outdoor raising of pigs, poor management, and deworming status. Higher incidence of parasitic pneumonia is usually seen in pigs raised in outdoor conditions because of easy access to intermediate host such as earthworms (Shima *et al.*, 2014). Grossly, lesions were restricted to dorsal and posterior borders of diaphragmatic lobes of lung. The affected lobules were well demarcated and slightly elevated than normal ones. Microscopically, lesions were characterized by presence of cut sections of parasite (*Metastrongylus spp.*) in bronchial lumen with mucinous exudates and cellular infiltration particularly eosinophils and mononuclear cells. The luminal epithelium was atrophied and desquamated. There was marked increase of lymphoid tissue in the peribronchial, peribronchiolar and perivascular areas. Variable degree of fibrosis was also seen in the peribronchiolar areas. Alveoli were filled with serofibrionus exudates and parasitic eggs **(Fig. 4)**. Similar gross and microscopic changes were reported by earlier workers also (Gupta, 1982; Lavanya *et al.*, 2011; Shima *et al.*, 2014).

Foreign body pneumonia was observed in a single case. Gross lesions revealed isolated patches of reddish grey hepatization distributed mainly in the apical and intermediate lobes. The overlying pleural membrane was thickened. Microscopically, a chitinous foreign body was seen in bronchi causing hemorrhage and destruction of bronchioles and adjoining lung tissue. Neutrophil infiltration was observed around the foreign body, bronchi, and adjoining lung parenchyma. Our findings are in agreement with previous work (Lavanya *et al.*, 2011).

This study was conducted to identify lung lesions present in the pigs at slaughter house. On the basis of gross and microscopic examination of porcine lungs collected from slaughter house, we observed pneumonia in 95% (90/95) cases. Lesions of interstitial pneumonia, lobar pneumonia, parasitic pneumonia, and foreign body pneumonia were observed in the present study. Though it is tough to draw conclusion of specific etiological agent and disease on the basis of slaughter house lesions and microscopic pathology as many of the respiratory lesions are reportedly multifactorial, yet an increase in the prevalence of a specific lesion could serve as warning system for an emerging or re-emerging infection (Kuker et al., 2018).

ACKNOWLEDGEMENTS

The authors are thankful to Joint Directors (Academic and Research) and the Head, Division of Pathology, IVRI, for providing necessary facilities.

REFERENCES

19th Livestock Census-2012 All India Report. (2014). Department of Animal Husbandry, Dairying, and Fisheries. Krishi Bhawan, New Delhi.

Brockmeier, S. L., Halbur, P. G., & Thacker, E. L. (2002). Porcine respiratory disease complex. In: Brogden KA, Guthmiller, JM, eds. Polymicrobial Diseases. Washington (DC). American Society of Microbiology Press.

Gupta, P.P. (1982). Prevalence of respiratory diseases of pigs in India. *J. Res. Punjab Agri. Univ.* **19(4):** 394-401.

Küker, S., Faverjon, C., Furrer, L., Berezowski, J., Posthaus, H., Rinaldi, F., & Vial, F. (2018). The value of necropsy reports for animal health surveillance. *BMC Vet. Res.*, **14(1):** 191.

Lavanya, K., Ramadevi, V. and Srilatha, Ch. (2011). Pneumonia in pigs – A pathomorphological study. *Indian J. Vet. Pathol.* **35(2):** 206-208.

Lee, S., Han, J. and Jeong, H. (1999). Observations of pneumonia in slaughtered pigs according to season. *Korean J. Vet. Res.* **39(1):** 85-89.

Lium, B. M. and Falk, K. (1991). An abattoir survey of pneumonia and pleuritis in slaughter weight swine from 9 selected herds.

Acta Vet. Scand. **32(1)**: 55-65.

Luna, L. G. (1968). Manual of histologic staining methods of the Armed Forces Institute of Pathology. 3rd edn. McGraw Hill Book Co., NewYork.

Maes, D., Deluyker, H., Verdonck, M., Castryck, F., Miry, C., Vrijens, B. Verbeke W, Viaene, J. and de Kruif, A. (1999). Effect of vaccination against Mycoplasma hyopneumoniae in pig herds with an all-in/all-out production system. *Vaccine* **17(9-10):**1024-1034.

Maes, D., Verdonck, M., Deluyker, H., and de Kruif, A. (1996). Enzootic pneumonia in pigs. *Vet. Q.*, **18(3):** 104-109.

Merialdi, G., Dottori, M., Bonilauri, P., Luppi, A., Gozio, S., Pozzi, P., Spaggiari B. and Martelli, P. (2012). Survey of pleuritis and pulmonary lesions in pigs at abattoir with a focus on the extent of the condition and herd risk factors. *Vet. J.* **193(1):** 234-239.

Pattanayak, G.M. and Gupta, P.P. 1982. Prevalence of respiratory diseases of pigs in India. *J. Res. Punjab Agric. Univ.,* **19(4):** 394-401.

Pointon, A.M., Sloane, M. (1984). An abattoir survey of the prevalence of lesions of enzootic pneumonia of pigs in South Australia. *Aust. Vet. J.,* **61(12):** 408-409.

Rao, A.N., Paliwal, O.P., Sharma, A.K. and Kumar, R. (2002). Pulmonary lesions in pigs. *Indian J. Vet. Pathol.* **26(1/2):** 53-56.

Shima, F.K., Garba, H.S. and Nongo, N.N. (2014). Prevalence of verminious pneumonia of pigs and associated helminth observed at slaughter in Makurdi, Benue state, Nigeria. *African J. Sci. Res.* **3(5):** 03-07.

Singh, K.P. (1975). Pneumonia and associated respiratory diseases of pigs epizootiological and pathoanotomical studies. Ph.D. Thesis submitted to Agra University, Agra.

Stärk, K. D. C., Pfeiffer, D. U. and Morris, R. S. (1998). Risk factors for respiratory diseases in New Zealand pig herds. *N. Z. Vet. J.* **46(1)**: 3-10.