

Original scientific paper

EVALUATION OF PULMONARY LESIONS IN SLAUGHTERED FATTENERS AS INDICATORS OF RESPIRATORY DISEASES IN PIGS

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SUMMARY

The goal of this research was to identify lung lesions in slaughtered fatteners originating from registered farms. Evaluation of lung lesions was based on their visible macroscopic features, which were then associated with corresponding diseases. Data on lung lesions in slaughtered fatteners were collected over the period spanning from October to December 2022 from three slaughterhouses (A, B, C), involving 150 fattening animals from each slaughterhouse. The examination of slaughtered pig lungs from all three slaughterhouses in our study revealed that *Mycoplasma hyopneumoniae* lesions in the lungs are the most prevalent, while *Actinobacillus pleuropneumonia* and bronchopneumonia occurrences are rare.

Key words:

pathomorphology, lung, fattening pig, respiratory disease

Abbreviations:

MP - mycoplasmal pneumonia; P - pleuritis; MPP - mycoplasmal pneumonia associated with pleuritis; AP - actinobacillus pneumonia; BP - bronchopneumonia

INTRODUCTION

The porcine respiratory disease complex (PRDC) is a multifactorial syndrome which affects the respiratory system of pigs and which is caused by interaction of infectious agents and environmental factors (Merialdi et al., 2012). Viruses and secondary bacterial infections elicit pronounced clinical symptoms (cough, sneezing, dyspnea). Different combinations and associated infectious agents generally complicate disease severity, including various lesions on the lungs (Loving et al., 2010; Cohen et al., 2020). Findings from previous studies indicate that tonsils are the main reservoir of *Actinobacillus pleuropneumoniae* in healthy pigs. The most prevalent lung lesion in slaughtered pigs is 'enzootic pneumonia', caused by co-infection with *M. hyopneumoniae* in combination with *P. multocida*, *G. parasuis*, or *Streptococcus suis*, and pleuritis caused by *A. pleuropneumoniae*, which is the most common bacterium causing chronic pleural lesions in pigs (Meyns et al., 2011; Merialdi et al., 2012; Paz-Sánchez et al., 2021). Outbreaks of respiratory diseases are commonly triggered by factors related to pig housing, farm management practices and environment, rather than by introduction of bacteria in a naive herd (Klinkenberg et al., 2014). Environmental conditions in pig housing facilities can seriously damage pigs' respiratory tract. Increased and uncontrolled presence of microbial agents in these environments, coupled with poor welfare standards, reduces pig productivity and immunity, leading to an onset of respiratory diseases in the herd (Cohen et al., 2020). Ammonia (NH₃) and dust (known as particulate matter) are the leading non-pathogenic causes of respiratory disease. Ammonia reduces ciliary activity and mucus flow, disrupting the mucosal clearance system, thereby predisposing the

respiratory tract of pigs to infections. Particulate matter is a mixture of food, feces, microorganisms and their toxins in the air and causes irritation of the respiratory tract, resulting in inflammation of the respiratory organs (Michiels et al., 2015). Therefore, the occurrence of respiratory infections in pigs can be attributed to inadequate housing facilities, poor nutrition and unfavorable environmental conditions (Cohen et al., 2020).

Given the propensity of respiratory diseases to manifest in subclinical forms, assessing the impact of respiratory diseases on pigs' health and productivity in clinical practice is generally challenging. Therefore, evaluation of lung lesions at the slaughter line serves as a valuable tool for estimating the prevalence and severity of respiratory infections. This entails detection of macroscopically visible pathological changes in the lungs, which serve as indicators of disease (Ostanello et al., 2007; Fraile et al., 2010; Karabasil et al., 2017).

The objective of this study was to identify pathomorphological changes in the lungs of fattening pigs from the studied farms.

MATERIAL AND METHODS

The data on lung examinations of the fattening pigs sourced from three slaughterhouses (A, B, C) located in the Srem region, Serbia, were collected between October and December 2022. The examination was performed on 150 lungs at each slaughterhouse, totaling 450 fattening pigs of both sexes, aged approximately 180 days, with an average fattening weight of 111.5 kg.

The lungs from pig carcasses were extirpated and placed on the examination table with the dorsal surface facing upwards. The examination of the lungs was conducted to assess the shape, size, color, consistency, and cross-sectional appearance of the lungs, as well as to identify any visible pathomorphological changes.

The results of the lung examinations and the extent of pathological changes were evaluated based on the methodology outlined by Došen et al. (2008). Accordingly, lung tissue hepatization lesions were associated with mycoplasma pneumonia, while the presence of abscesses in the cranial and medial lobules, as well as the presence of purulent bronchiectasis, was linked to lesions typically occurring in suppurative bronchopneumonia. Furthermore, the identification of fibrinous or hemorrhagic changes was associated with lesions that may be caused by *A. pleuropneumoniae*. Inflammatory processes resulting in noticeable clouding of the pleura were diagnosed as pleuritis.

RESULTS AND DISCUSSION

The appearance of lung pathomorphological changes are shown in Figure 1.

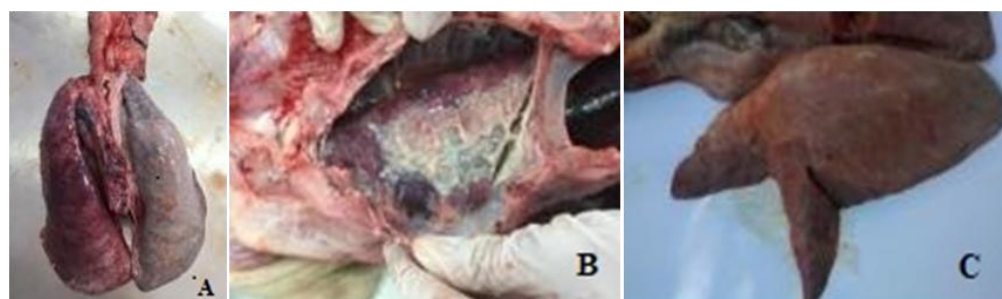


Figure 1. A – Mycoplasmal pneumonia associated with pleuritis; B – Actinobacillus pneumonia, C – Bronchopneumonia

Among the 150 examined lungs from slaughterhouse A, no visible lesions were detected in 122 (81.33%) lungs, while lung lesions were found in 28 (18.67%) of the slaughtered fatteners. The detected lung lesions are summarized in Table 1.

Table 1. Lesions on fatteners lungs from slaughterhouse A

Pathological changes	Number of lungs	Lung percentage
MP	13	8.67%
P	7	4.67%
MPP	5	3.33%
AP	3	2%
BP	0	0%
Total number of detected lesions	28	18.67%

No lesions	122	81.33%
Total	150	100%
Legend: MP – mycoplasmal pneumonia; P – pleuritis; MPP – mycoplasmal pneumonia associated with pleuritis; AP – actinobacillus pneumonia; BP – bronchopneumonia		

The visible lung lesions observed in the examined fatteners were attributed to mycoplasma pneumonia (MP) in 13 out of 150 cases (8.67%), mycoplasma pneumonia associated with pleuritis (MPP) in 5 out of 150 cases (3.33%), and actinobacillus pneumonia (AP) in 3 out of 150 cases (2%). Pleuritis was diagnosed in 7 out of 150 cases (4.67%).

Table 2. Lesions on fattener lungs from slaughterhouse B

Pathological changes	Number of lungs	Lung percentage
MP	14	9.33%
P	9	6%
MPP	4	2.67%
AP	2	1.33%
BP	4	2.67%
Total number of detected lesions	33	22%
No lesions	117	78%
Total	150	100%
Legend: MP – mycoplasmal pneumonia; P – pleuritis; MPP – mycoplasmal pneumonia associated with pleuritis; AP – actinobacillus pneumonia; BP – bronchopneumonia		

The observed lesions on fattener lungs from slaughterhouse B were attributed to mycoplasmal pneumonia in 14 out of 150 cases (9.33%), mycoplasmal pneumonia associated with pleuritis and bronchopneumonia in 4 out of 150 cases (2.67%), pleuritis alone in 9 out of 150 cases (6%), while actinobacillus pneumonia was detected only in 2 cases (1.33%).

Among the 150 examined fatteners from slaughterhouse C, lesions were identified on 27 lungs (18%), while 123 lungs (82%) exhibited no visible pathological lesions.

Table 3. Pathomorphological changes on fattener lungs from slaughterhouse C

Pathological changes	Number of lungs	Lung percentage
MP	14	9.33%
P	10	6.67%
MPP	3	2%
AP	0	0%
BP	0	0%
Total number of detected lesions	27	18%
No lesions	123	82%
Total	150	100%
Legend: MP – mycoplasmal pneumonia; P – pleuritis; MPP – mycoplasmal pneumonia associated with pleuritis; AP – actinobacillus pneumonia; BP – bronchopneumonia		

The observed lesions were attributed to mycoplasmal pneumonia in 14 out of 150 cases (9.33%), mycoplasmal pneumonia associated with pleuritis in 3 out of 150 cases (2%), and pleuritis alone in 10 out of 150 cases (6.67%), while actinobacillus pneumonia and bronchopneumonia were not detected.

Among the 450 fatteners examined, no visible lung lesions were found in 362 cases (80.44%), while lesions were identified in 88 cases (19.56%), as shown in Table 4.

Table 4. Lung lesions in examined fatteners

Pathological changes	Number of lungs	Lung percentage
MP	41	9.11%
P	26	5.78%
MPP	12	2.67%
AP	5	1.11%
BP	4	0.89%
Total number of detected lesions	88	19.56%

No lesions	362	80.44%
Total	450	100%
Legend: MP – mycoplasmal pneumonia; P – pleuritis; MPP – mycoplasmal pneumonia associated with pleuritis; AP – actinobacillus pneumonia; BP – bronchopneumonia		

The analysis indicated that mycoplasmal pneumonia was observed in 41 cases (9.11%), pleuritis in 26 cases (5.78%), mycoplasmal pneumonia associated with pleuritis in 12 cases (2.67%), actinobacillus pneumonia in 5 cases (1.11%), and bronchopneumonia in 4 cases (0.89%).

Diagnosing and assessing the severity of respiratory diseases in pig herds can be conducted through clinical examination, post-mortem examinations of dead pigs, and routine slaughter checks (VanAlstine, 2012). Although information provided by slaughterhouse inspections regarding the presence of subclinical respiratory diseases is important, lung lesions are insufficient indicators of pig health status. Namely, lung lesions can heal without scarring, posing a challenge to early detection of respiratory diseases in the herd (Pagot et al., 2007; Meyns et al., 2011; Fablet et al., 2012; Pessoa et al., 2021). The results of our study can be compared to the results reported by Karabasil et al. (2017). Contrary to our findings, these authors identified visible macroscopic lesions in 32.91% of the examined lungs. Furthermore, their study indicated that 67.09% of the examined pigs had either pneumonia or pneumonia accompanied by pleuritis and the enlargement of mediastinal lymph nodes. Meyns et al. (2011) reported pleuritis in 62.3% of the examined lungs, while pneumonic lesions were present in 23.85% of cases, and these lesions were predominant over the lesions of MPP (2.67%) in the examined lungs. Similar findings on the importance of pleuritis and pneumonic lesions in slaughtered fatteners were documented by Martínez et al. (2009) and Sassu et al. (2018). *M. hyopneumoniae* is the predominant etiological agent of chronic respiratory diseases in pigs (Sibila et al. 2009), causing substantial economic losses in global pig industry (Nathues et al., 2017). Introduction of *M. hyopneumoniae* into naive herds typically occurs by purchasing animals with subclinical infections. It is subsequently spread within the herd through direct contact between infected sows and their offspring as well as between infected and uninfected piglets, but it can also be spread through airborne transmission.

Karabasil et al. (2017) underlined the role of *M. hyopneumoniae* in the development of secondary bacterial pneumonias, indicating that the presence of mucopurulent bronchopneumonia in 33% of cases in their study stemmed from prior *M. hyopneumoniae* infection. Microscopic examination of lungs from slaughtered pigs and detection of subacute or chronic interstitial pneumonia are crucial in diagnosing respiratory diseases, including secondary bacterial pneumonias in fattening pigs.

In the study conducted by Rodrigues da Costa et al. (2020), it was found that the prevalence of lung scars was 17%, suggesting that 38.5% of the examined pigs had experienced pneumonia at some point in their lives. Furthermore, the prevalence of pneumonic lesions was 21.5%, with the affected lung surface being 10.9% higher compared to other studied farms, where the prevalence of pneumonic lesions was 11%, affecting 5.8% of the lung surface. Pessoa et al. (2021) concurred with these findings, concluding that pneumonia-related lesions align with the presence of clinical signs of respiratory diseases on farms. Chiers et al. (2002) conducted a study in which tonsillar and nasal swabs from weaned pigs were sampled for bacterial culture and PCR testing to ascertain the presence of bacteria in upper respiratory tract. The results indicated the presence of *S. suis*, *G. parasuis* and *P. multocida* and *A. pleuropneumoniae* detected by PCR as well as *A. pleuropneumoniae* identified by bacterial culture.

CONCLUSION

Chronic and acute pleuritis, as well as pneumonia, frequently occur in slaughtered fatteners worldwide, having detrimental economic impact on pig production. Pathological lung lesions are caused by interaction of factors related to poor welfare standards and infection outbreaks on farms. Consequently, inadequate temperature, air pollution, deficient nutrition, and overcrowding, coupled with viral and bacterial infections, lead to the onset of diseases with fatal outcomes. The examination of slaughtered pig lungs in our study revealed that *Mycoplasma hyopneumoniae* lesions in the lungs are the most prevalent, while *Actinobacillus pleuropneumonia* and bronchopneumonia occurrences are rare.

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Conflict of interest: The authors declare that they have no conflict of interest.

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