

THE BACTERIAL INFECTIONS OF RESPIRATORY TRACT OF SWINE**

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Abstract: Respiratory diseases are one of the most important problem in modern, intensive swine production, in the world but also in our country. Intensifying pig production increases frequency and economic importance of this disease, regardless to the measures for its control. Great economic losses are expressed through direct losses due to death and compulsory slaughter, reduced daily gain, a larger feed intake for average daily gain, prolonged time of fattening, enlarged costs of treatment and a high percentage of light pigs in abattoirs.

As a material for research we used the parts of respiratory organs (the lungs and mediastinal lymphonodes) deriving from 125 pigs in total. The evaluation included animals from: 11 industrial swine farms, four medium-sized swine farms, and swine deriving from 17 individual (private) backyards. Bacterial isolation was carried out by aerobic, anaerobic and microaerophil microorganism cultivation. The identification included determination of their physiological properties by biochemical characteristics. From the examined samples of respiratory organs, the most frequently were isolated *Pasteurella sp.* (26.57%), *E. coli* (26.57%), *Streptococcus sp.* (16.7%), *Staphylococcus sp.* (5.59%) and *Klebsiella pneumoniae* (4.90%). The solitary infective agens from total 72 examined samples was isolated (57.60%), while in 53 examined samples (42.4%) the presence of mixed infection was detected.

Key words: swine farm, respiratory disease, bacterial infection

Introduction

Respiratory diseases are one of the most important problem in modern, intensive swine production, in the world but also in our country. Intensifying pig production increases frequency and economic importance of this disease,

regardless to the measures for its control. Great economic losses are expressed through direct losses due to death and compulsory slaughter, reduced daily gain, a larger feed intake for average daily gain, prolonged time of fattening, enlarged costs of treatment and a high percentage of light pigs in abattoirs. It was established that economic losses due to occurrence of respiratory diseases in swine production are consequence of: lung condemnation (3%), condemnation of the diseased animals (37%) and reduced weight gain (60%) (4, 5).

As a primary causes of respiratory diseases are considered Porcine Reproductive and Respiratory Syndrome virus (PRRSV), Porcine circoviruses, Swine influenza virus, and infections caused by *Mycoplasma hyopneumoniae*, *Actinobacillus pleuropneumoniae*, *Bordetella bronchiseptica*, *Haemophilus parasuis* and sometimes the virus of Aujeszky's disease. The secondary agents that are important include infection caused by *Pasteurella multocida*, *Streptococcus suis* i *Actinobacillus suis* (2,3). The most frequent route of disease agents introduction are purchasing of infected pigs or semen for artificial insemination originating from another swine farm. The aim of this research was to evaluate the significance of bacterial infections on occurrence of respiratory tract disease of swine.

Material and methods

As a material for research we used the parts of respiratory organs (the lungs and mediastinal lymph nodes) deriving from 125 pigs in total. For these animals it was considered that they had died due to respiratory disease. The evaluation included animals from: 11 industrial swine farms, four medium-sized swine farms, and swine deriving from 17 individual (private) backyards. Bacterial isolation was carried out by aerobic, anaerobic and microaerophilic microorganism cultivation. The identification included determination of their physiological properties by biochemical characteristics.

Results and discussion

The obtained results from previous research pointed out that the disease structure and pathological picture on the succumbed fatteners in the most cases included respiratory syndrome (80%). Pathological changes, characteristic for pleuropneumonia, were present in 60% and

bronchopneumonia in 20% of the examined cases (2). Examining the organs in chest cavity in 65.75% of slaughtered light pigs changes on lung tissue were observed. Changes on lung tissue were discovered only in the smallest percent of apical (2.74%) or only on cardinal lung lobes (4.1%). In the largest number of the examined samples (42.46%), pathological process was simultaneously present in apical, cardinal and diaphragmal lung lobes (2).

On the bases of necropsy and result of patomorphological examination, it was concluded that the diseases of the respiratory tract in succumbed pigs had characteristics of acute, subacute and chronic course. It was observed that the diseases became most often complicated by secondary infections and spreading of pathologic process on distal lung lobes. In such cases the pathological process are expressed through purple to gray areas of consolidation of lung tissue (*Pneumonia fibrinosa in statu hepatisationis rubrae et griseae*), and macroscopically the lung lobes are very similar to the hepato or pancreatic tissues. By the rule, pleuropneumonia and pericarditis may also be present. On the lung tissue the presence of fibrin deposits (*Inflammatio fibrinosa pleurae pulmonalis*) or even more often the production of adherence (adhesions) between the visceral and parietal pleurae (*Pleuritis adhaesiva circumscripta et diffusa, Pleuritis fibrinoplastica adhaesiva*). Besides this, the presence of abscesses in lung tissues was discovered (*Pneumonia apostematosa disseminata*). Patologically the pericarditis was found as an independent or included in the patomorphological picture of bronchopneumoniae and pleuropneumoniae. It was discovered that the pathological process on the pericard was of different intensity: *Pericarditis fibrinosa, Pericarditis fibrinosa massiva, Pericarditis fibrinosa diffusa partim villosa* and *Pericarditis villosa (filamentosa)*.

The upper respiratory tract is the natural habitat for great number of commensal microorganismus, including viruses, mycolasmas, chlamydias and other bacteria. The commensal microflora may have a favourable competitive effect for their host in outnumbering pathogenic agents. There is no distinct division between commensals and potentially pathogenic microorganisms. From the upper respiratory tract and bronchial tree of healthy pigs the following microflora was normally found: streptococci (alfa-haemolytic and nonhemolytic), staphylococci, *Escherichia coli*, *Klebsiella* and *Arcanobacterium pyogenes*. *Haemophilus parasuis* and *Bordetella bronchiseptica* were rarely isolated, and *Pasteurella multocida* has never been isolated in the bronchial tree of healthy pigs (1,5).

From the examined samples of respiratory organs, *Pasteurella sp.* was the most frequently isolated (26.57%). Also, in the examined samples in

24.47% cases *P. multocida* and in 2.10% cases *Manheimia (Pasteurella) haemolytica* were isolated. *Baekbo and Nielsen* (1988) measured airborne transmission *P. multocida* in herds suffering from atrophic rhinitis. They were able to isolate the organism in 29 of 44 herds studied. The results from our research indicate that the incidence of infection with *P. multocida* on our farms is significantly higher (detected on 9 out of total of 11 examined swine farms). Although aerosol transmission may occasionally occur within the herd, probably nose-to-nose contact is the common route of infection. Both vertical and horizontal transmission occur, although within farms most transmission appears to be horizontal, with one strain predominating in pneumonic lungs). It is considered that *P. multocida* is not a primary agent of pneumonia but rather follows infections with other agents (in disease). In total of 25 examined samples (26.88%) deriving from large swine farms, *Pasteurella* was the only isolated agents. Vaccination against hog cholera virus and infection with Aujeszky's virus or *M. hyopneumoniae* have been shown to predispose the pig to superinfections with *P. multocida* (5).

Further the most often isolated causative agents from examined samples of respiratory organs included *E. coli* (26.57%), *Streptococcus sp.* (16.7%), *Staphylococcus sp.* (5.59%) and *K. pneumoniae* (4.90%). The solitary infective agents from total 72 examined samples was isolated (57.60%), while in 53 examined samples (42.4%) the presence of mixed infection was detected.

From the examined samples of respiratory organs, *A. pleuropneumoniae* and *H. parasitus* were detected in 3.50% cases. The presence of *A. pleuropneumoniae* is usually associated with the disease, subclinical more often than clinical. This can be especially the problem in the immunologically weak state between passive and active immunity in piglets (5). In order to examine the widespread of actinobacillosis in swine, *Vidić et al.* (2003) examined in total 764 sera samples deriving from breeding animals, from four different herds by method of microagglutination. The established percent of serologically positive animals was in range 27.5-66.6%, with titre of antibody from 1:8 to 1:128.

Several streptococcal species can be found in tonsils, intestines and genital tracts of clinically healthy pigs, and some of them are potential pathogens. Among species considered as part of the intestinal microflora in swine, are *S. intestinalis*, *S. hyointestinalis*, *S. suis* i *S. bovis*. In tonsils are generally found *S. suis*, *S. porcinus* i *S. dysgalatae* subsp. *equisimilis* (4,5). From the examined samples of respiratory organs, *Streptococcus sp.* was isolated in 16.7% cases.

Table 1. The isolates from the lung samples deriving from 125 pigs died due to disease of the respiratory tract

Type of causative agent	The number of isolates	% of isolates
<i>Pasteurella multocida</i>	35	24.47
<i>Manheimia (Pasteurella) haemolytica</i>	3	2.10
<i>Pasteurella sp.</i>	38	26.57
<i>E. coli</i>	38	26.57
<i>Streptococcus alfa-haemolyticus</i>	10	6.99
<i>Streptococcus beta-hemolyticus</i>	3	2.10
<i>Streptococcus equi subsp. equisimilis</i>	3	2.10
<i>Streptococcus suis</i>	2	1.40
<i>Streptococcus pyogenes</i>	2	1.40
<i>Streptococcus dysgalactiae subsp. equisimilis</i>	2	1.40
<i>Streptococcus uberis</i>	1	0.70
<i>Streptococcus non A non B group</i>	1	0.70
<i>Streptococcus sp.</i>	24	16.7
<i>Staphylococcus sp.</i>	5	3.50
<i>Staphylococcus epidermis</i>	3	2.10
<i>Staphylococcus sp.</i>	8	5.59
<i>Klebsiella pneumoniae</i>	7	4.90
<i>Actinobacillus pleuropneumoniae</i>	5	3.50
<i>Haemophilus parasuis</i>	5	3.50
<i>Pseudomonas aeruginosa</i>	4	2.80
<i>Corynebacterium sp</i>	3	2.10
<i>Acinetobacter calcoaceticus</i>	3	2.10
<i>Arcanobacterium (Actinomyces) pyogenes</i>	2	1.40
<i>Salmonella typhimurium</i>	2	1.40
<i>Salmonella chleraesuius</i>	2	1.40
<i>Erysipelothrix rhusiopathiae</i>	1	0.70
<i>Serratia sp.</i>	1	0.70
Total	143	100

In swine, members of the *S. dysgalactiae* subspecies *equisimilis* species are all beta-hemolytic streptococci. Although members of the normal flora, they are considered the most important beta-hemolytic streptococci involved in lesions in pigs. *S. dysgalactiae* group C streptococci are common in nasal and throat secretions, tonsils, and vaginal and preputional secretions. Vaginal secretions and milk from postparturient sows are the most likely sources of infection for the piglets. Streptococci enter the bloodstream via skin wounds, the navel and tonsils. A bacteriemia or septicemia occurs, and the organism then settle in one or more tissues, giving rise to arthritis, endocarditis, or meningitis. Insufficient consumption of colostrum or milk or

inadequate levels of antibodies, especially in gilts, may predispose to disease (5,6).

Conclusion

In the cases of occurrence of disease of respiratory tract of swine, bacterial infections are mostly consequence of secondary infections, in the most of the cases with *Pasteurella sp.*, *Streptococcus sp.*, *Staphylococcus sp.* and *E. coli*. The pneumoniae can be, although relatively rarely, caused by infection with *Salmonella sp.* and *K. pneumoniae*. Certainly that bacteriological determination of the causative agent and diagnose confirmation are necessary included in diagnosing process. The first reason is the importance of respiratory diseases in control of the health status of the herd and secondary, due to the potential economic losses.

BAKTERIJSKE INFEKCIJE RESPIRATORNOG TRAKTA SVINJA

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Rezime

Respiratorne bolesti su jedan od najvažnijih problema savremene, intenzivne proizvodnje svinja, kako u svetu tako i u našoj zemlji. Intenziviranjem svinjarske proizvodnje uvećava se frekvencija i ekonomski značaj ovih bolesti, bez obzira na dosadašnje mere za njihovo suzbijanje. Kao materijal za istraživanja koristili smo delove respiratornih organa (pluća i medijastinalne limfne čvorove) poreklom od 125 svinja koje su uginule usled bolesti respiratornog trakta. Iz uzoraka organa respiratornog trakta najčešće su izolovani *Pasteurella sp.* (26.57%), *E. coli*, (26.57%), *Streptococcus sp.* (16.7%), *Staphylococcus sp.* (5.59%) i *Klebsiella pneumoniae* (4.90%). Bakteriološka determinacija uzročnika i potvrda dijagnoze svakako treba da bude uključena, kako zbog značaja respiratornih oboljenja u kontroli zdravstvenog statusa zapata svinja, tako i zbog potencijalnih ekonomskih gubitaka.

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