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The Feature of Course and Pathological Changes of Pigs' Pasteurellosis

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Abstract: In this article the data of the character of course and pathology-anatomical structure of pasteurellosis of pigs from Almaty region are given. The disease is characterized by acute, subacute and chronic course, that took place in chest and intestinals forms. Out of 11 chosen cultures 5 belonged to serotype B of *Pasteurella multocida*, 2 cultures to serotype A and 4 to serotype D. Acute form of disease is caused mainly by serotype B. In case of subacute and chronic course of disease Pasteurella cultures of serotypes A, B and mixed forms were isolated. Postmortem pathologic picture in some cases represented by hemorrhagic gastroenteritis and in other cases in the lungs the focuses of croupous, croupous - necrotizing pneumonia are founded.

Key words: Pasteurella multocida · Pasteurellosis · Patomorphology · Hàhemorrhagic Gastroenteritis · Croupous Pneumonia.

INTRODUCTION

Along with other sectors of agriculture, pig farming is one of the most important branches of modern animal husbandry. Pigs are animals with high average daily gain, they are precocious and prolific, so further development of this industry depends largely on getting healthy offspring and its full preservation and also depends upon welfare of epizootic farms and their safety from infectious diseases.

In recent years certain progress has been made in study of pigs' infectious diseases both viral and bacterial by nature [1,2]. However, as we organize effective systems and methods of fighting diseases, some diseases become more important than others. Such diseases include pigs' pasteurellosis has been registered on farms of Almaty region [3].

According to the report of the Committee of veterinary control and supervision of the Ministry of Agriculture in 2012 were reported 4 outbreaks of pasteurellosis and in 2013 were reported 15 outbreaks of the disease in the republic, that is, tends to increase [4].

Pasteurellosis (hemorrhagic hematosepsis)- is a disease of many types of farm and wild animals, characterized by hematosepsis and hemorrhagic inflammatory processes [5-7]. The disease occurs worldwide. Economic damage caused by Pasteurella consists of losses from mortality, forced slaughter of sick animals and costs of preventive and curative measures [8-11].

Solving of the problem of fighting pasteurellosis is complicated by the fact that pathogenic Pasteurellas can persist for a long time in the body of not only recovered animals and animals that were in contact with infected ones, but in the body of commensal rodents and birds, creating a kind of stationary epizootic pesthole [12].

The Aim of this Study: To study the peculiarities of pasteurellosis in pig farms of Almaty region, study clinical and pathological changes; develop effective system of treatment and preventive measures against pigs' pasteurellosis.

MATERIALS AND METHODS

Studies were conducted on farms of Almaty region, as well as in the laboratory of biosafety at Kazakh National Agrarian University. Clinical examination was performed according to the standard methods. While examining pigs in farms were selectively measured of body temperature, figured terms of disease and its case severity. Diagnosis is based on epizootic, clinical, pathological and laboratory studies.

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After slaughter a thorough pathologic-anatomical examination has been made for diagnostic purposes and for bacteriological examination; the following samples have been takes: blood from the heart, lymph nodes (mesenteric, retropharyngeal, mediastinal), pieces of lungs, liver, spleen, heart, kidney, tubular bones. Pathological material obtained for bacteriological research, was conserved with 30% glycerol sterile solution. Bacteriological examination was carried out by the standart methods [13]. From pathological material that was brought to laboratory was prepared for microscopy investigations, some samples cultivated on nutrient medium and suspension for bioassay on white mice and rabbits was done. The microscopical investigations, the tissue slides were stained by the Romanovski-Giemsa and Gram methods [14]. For specific differentiation the ability to grow of pasterella studied on Mac-Conkey agar. Biochemical identification can be carried out using the test system API20 NE (Bio Mericx) [15].

For histological examination the following samples were taken: pieces of liver, kidney, lungs, myocardium, spleen, lymph nodes, rumen, abomasums, bowel and mammary gland. Pathological material was fixed in 10 % neutral aqueous solution of formalin [16]. These organ pieces after processing were put into paraffin and celloidin. The conventional histological techniques and some histochemical reactions have been used by Merkulov [16]. The lipids were detected by Sudan III-IV, glycogen by SHIC - reaction [16]. Clinical monitoring of animals was performed and the health condition and fatality rates in groups in both periods were tracked.

For the treatment were used medicines which approved for use in veterinary practice by the Committee of veterinary control and supervision of the Ministry of Agriculture: serum against pasteurellosis of cattle, sheep and pigs ("Vitebsk Biofabric», Belarus), chloramphenicol (ASKONT +, Russia), Biovit 80 ("Zaporozhbiosynthesis", Ukraine).

RESULTS

Clinical examination was performed on a total of 348 pigs, of which 23 were sick; 9 postmortem autopsies has been performed on dead and slaughtered animals, 15 bacteriology sample studies have been conducted and 11 Pasteurella cultures have been isolated.

The examination of pasteurellosis of livestock at farm resulted in the clinical diagnosis of 23 pigs of different ages. The following clinical signs of the disease have been observed.

In five cases, the acute case of disease was observed. In this case disease lasted for 1-3 days. Severe worsening of general condition observed loss of appetite, rejection of food and drinking, inactivity. Body temperature rose to 40.5 - 41.0°C. Sometimes diarrhea was observed. The expiration of the nasal openings and serous and serous - mucous characters sometimes mixed with blood. Rapid breathing, shortness of breath and coughing were observed. Noted the presence of swelling in the neck and head, some animals also developed paralysis of the hind limbs.

Sub acute case of the disease continued until 14 days and ended either with death of animal or recovery (pasteurellas remain in their body and can be transmitted to others) or transition to chronic form. In case of subacute form animals rejected food, had loss of appetite, were inactive and often sat in the farthest corner of cages and poorly responded to external stimuli. Breathing is rapid and difficult with audible wheezing, visible mucous membranes are cyanotic. Intercostals spaces sink down during inspiration, particularly well expressed in case of damaged pleurae on ribs' side often observed. Discharge from the nostrils is small of slimy consistence, sometimes a crust is formed around the nostrils.

During the chronic form (12 cases) a progressive depletion of the animal observed. Fatness was below average, bristles were dull and coarse. Also moderate appetite observed. Animal often show signs of fatigue and tiredness, the temperature fluctuated within the physiological range. There were signs of lungs disease: shortness of breath, difficulty with breathing, pain during palpation of the chest side from the affected adjacent pleura. In case of rapid breathing (compensation of gas exchange function), there was cyanosis and often minor yellowness of the visible mucous membranes. The discharge from nasal openings was minor and of mucous character.

Thus, the most frequent clinical manifestation of the disease was the paralysis of the respiratory system that becomes protracted; rarely acute septic and chronic case in adult animals observed.

Postmortem study of pigs was made directly on the farm and in the Department of Biological Safety. It's been found that the nature of pathological changes primarily depends on form of the disease, which in turn depends on the pathogenicity of the pathogen, the impact of environmental factors and other factors (feeding, age, treatment, etc.)

Fig. 1: Corps of three-week-old piglets fallen of pasteurellosis

Fig. 2: Haemorrhages in internal organs of fallen piglets

Pigs from 3 to 10 weeks of age showed predominant changes in the gastrointestinal tract: well expressed hemorhagic gastroenteritis, abdominal accumulation of serous fluid with blood, stomach and intestine content with blood and mucous; mucosa is collected in folds, is turbid and diffusely reddened (Figure 1,2).

In head and neck gelatinous edema of the subcutaneous tissue were observed. Submandibular lungs (bronchial, mediastinal) lymph nodes and slightly swollen, the cut pattern is erased. The liver is slightly increased in volume, moderately thick by consistency with grayish- brown color. Spleen of all animals was slightly increased, with dense consistency. Kidneys are slightly increased, the capsule can be easily removed, consistency is moderately thick and boundary layers are well expressed.

The highest percentage of pasteurellosis in pigs takes subacute and chronic form. In these cases pigs had substantial failure of the respiratory system and particularly the lungs.

In case of subacute form lobar pneumonia often took place, which at the time of animal's death occupied up to 2/3 of the lung tissue.

Pathological process also captured pleura. When such cases took place a large amount of fibrin deposited on the ribs' pleura almost always detected. Presence of serous fibrin fluid in the pleural cavity was low.

The autopsy of slaughtered pigs with a clinical form of chronic disease course observed in the lungs foci of croupous, croupous-necrotizing pneumonia, which occupied a small part of the lungs. Fibrinous Plevritis also occurred in small areas. The liver was in state of granular and fatty degeneration, sometimes with small necrosis. In general, chronic form can be described as the process of organism's long recovery under illness.

Pathological changes in pigs under pasteurellosis have vivid tropism towards the respiratory and digestive system with formation of characteristic changes depending on course of disease and age of the animals.

Bacteriological examination of the 11 cases highlighted cultures of microorganisms, which are attributed to *Pasteurella multocida* by features of cultural, morphological, biochemical and biological properties.

To conduct bacteriological study, 15 samples were selected. For allocation a pure cultures two white mice were infected by pathological material. It's been found that death of at least one of the pair of mice occurs during the first three days in 18 cases, during 3-5 days in 10 cases and in 2 cases up to one week. Thus there is regularity in the pathogenicity of cultures both for laboratory mice and pigs. Cultures with low pathogenicity were allocated from slaughtered animals with chronic disease.

In microscopy examination of smear from lungs and blood from heart observed cells, cocci - ovoid and ovoid forms, sometimes presence of polymorphic forms bipolarity expressed in varying degrees, capsule is expressed from mild to clear. Mobility is absent. In smears from cultures cells had ovoid shape, often located separately, but there were also paired and group clusters.

All the 11 allocated cultures grew equally on conventional MPA and MPB and on serum agar. Growth in MPB was observed by the end of first 24 hours of cultivation and was characterized by a uniform haze of varying intensity in medium. 2-3 days of cultivation gave a copious precipitate, sometimes very abundant, mucous

by character, sometimes with fine cotton-like structure. During shaking the sediment raises as moire ribbon, copious mucous sediment rises in the form of a ribbon or cord.

During grown on MPA culture growth consisted of three main types: small colonies, semi-transparent, S-shaped with smooth edges. Most colonies looked like merged grayish colonies, with mucous consistency. Growth often was so abundant that it formed extensive gelatinous R-form colonies mucous by consistency.

But in most cases cultures had symptoms of common to S- and R-forms transitional forms. The total number of S-forms under primary allocation of cultures on serum MPA totaled 3 cultures, R-form had 5 cultures and transitional forms had 3 cultures. In general, this division is rather arbitrary, since under cultivation one can easily find similar colony similar to one of above form.

All 11 allocated cultures determined standard set of saccharolytic, proteolytic, redox - and hemolytic properties required for the differentiation of species. All allocated cultures were continuously fermented with production of an acid without emission of gas, glucose, mannose, sucrose and mannitol. Proteolytic properties are weak, culture do not curdle milk, do not liquefy gelatin, but constantly secrete indole.

All 11 obtained cultures had been tested for definition of serotype composition by setting hyaluronidase and acryflavin tests. Since acryflavin test determined only serotype D and hyaluronidase test only serotype A, type B was set in the absence of a positive result from both tests. When positive reaction was unclear, in acryflavin test we had to count culture of mixed serotype composition or so-called dissociated culture. Of the 11 allocated cultures 5 belonged to serotype B, 2 to serotype A, 4 to serotype D. It was found that the acute course of the disease corresponds to serotype B; in case of subacute and chronic course the remaining serotypes are A, B and mixed. Consequently, for the most effective prevention of pasteurellosis in pigs it's necessary that a vaccine needs to contain antigens of all three serotypes of epizootic strains of *Pasteurella*.

To prevent the spread of infection on farm during an outbreak of pasteurellosis was carried out a comprehensive therapy. For that was used hyperimmune serum and antibiotics. Levomicetin was given with food by group method by giving 20-40 mg per 1 kg of body weight per week. As a result of the experiment we found that use of hyperimmune serum in combination with antibiotic and vitamin therapy (Biovit 80) is effective for preventive actions against pigs' pasteurellosis.

DISCUSSION

Analysis of the literature showed that pasteurellosis infection is widespread in many countries [17-20]. In Kazakhstan, there are large outbreaks of pasteurellosis of Caspian seals, as well as among the saiga from 2001 to 2011[21].

Various forms of Pasteurella cause great economic damage to agriculture [21]. Manifold forms of pasteurellosis several authors explained by different pathogens, different resistance of animals, place the introduction of infection involving other pathogens. In addition, some researchers consider infectious rhinitis and pneumonia in swine as distinct diseases.

According to them serogroup A and D can cause atrophic rhinitis and pulmonary pasteurellosis [24-26]. Serogroup B causes acute septicemic form of pasteurellosis [27]. Disease in the investigated farms is acute, subacute and chronic.

As a result of bacteriological study, we identified 11 cultures of Pasteurella multocida. It was found that the acute course of the disease corresponds to serotype B, subacute and chronic course of the remaining serotypes A, B, D and mixed. Acute form of pasteurellosis manifested in the form of oedema, body temperature rises to 40.5 - 41.0°C. Sometimes diarrhea was observed.

The expiration of the nasal openings and were serous and serous-mucous character, sometimes mixed with blood. Subacute form possessed with damage of the respiratory system, with frequent breathing, labored, appeared dry painful cough, serous and then purulent discharge from the nose. During the chronic form progressive depletion was observed.

There were signs of lung disease: shortness of breath, difficulty breathing and pain on palpation of the chest wall from the affected adjacent pleura.

Pigs of 3 to 10 weeks age predominant changes in the gastrointestinal tract: very pronounced bleeding gastroenteritis; accumulation in the abdominal cavity of serous fluid mixed with blood; in the stomach and intestine mucosal blood content; collected in the mucous folds, muddy and diffusely reddened.

During subacute form lobar pneumonia often developed. When such lesions are almost always detected a large amount of fibrin deposited on the costal pleura.

In the result of postmortem researches of the pigs slaughtered with a clinical picture of chronic course of the disease in the lung lesions showed lobar, croupous-necrotizing pneumonia, which occupy a small part of the lung.

According to P.I. Kokurichev (1994) in the case of swine pasteurellosis petechiae on serous integument, mucous membranes and in parenchymal organs observed, especially clearly they appear in the chest cavity on the costal and pulmonary pleura serous under cover, which in our case we have not seen[28].

CONCLUSIONS

Thus, by the results of research we can make the following conclusions:

- Pasteurellosis found in Almaty region. The causative agent of the disease is Pasteurella multocida..
- Most frequent clinical manifestation of the disease is the paralysis of the respiratory system, the receiving protracted; rarely observed during the acute septic. At postmortem researches of animals with acute course of the disease along with the appearance of swelling in the head, submandibular space, dominated by changes in the gastrointestinal tract and in subacute and chronic course of the disease was observed in the lung lesion.
- The intestinal form of the disease showed the following pathologic changes: very vivid hemorrhagic gastroenteritis, abdominal accumulation of serous fluid mixed with blood, in the stomach and intestines presence of bloody - slimy contents; mucous is gathered into folds and is muddy and diffusely reddened.
- The thoracic form: the lungs had foci of croupous, croupous - necrotizing pneumonia, occupying a small part of the lungs. Fibrinous Plevritis also occurs in small areas.
- Using of the hyperimmune serum in combination with antibiotic gives 100% effectiveness of therapeutic measures.

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