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ETIOLOGICAL STRUCTURE OF STREPTOCOCCOSIS OF PIGS IN VARIOUS REGIONS OF THE RUSSIAN FEDERATION

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ABSTRACT

The paper presents the results of laboratory-diagnostic studies of 8 pig-breeding enterprises in various regions of the Russian Federation conducted to isolate pathogens of streptococcosis of pigs and determine their etiological structure. It was found that Streptococcus dysgalactiae and S. massiliensis circulated in 50% of the enterprises, Streptococcus porcinus, S. mutans and S. pyogenes in 37.5% of cases, Streptococcus agalactiae, S. gallolyticus, S. rubneri and S. uberis in 25 % of cases, and Streptococcus iniae, S. lutetiensis, S. pneumoniae and S. suis in 12.5% of cases. The pathogenic properties of isolated cultures were identified on laboratory animals. Streptococcus dysgalactiae, S. porcinus, S. pyogenes and S. Sui have pathogenicity, which justifies the inclusion of these streptococci species in the antigenic composition of the vaccine for the specific prevention of pigs from streptococcosis.

KEY WORDS

Streptococcosis, coccal infection, biosafety, clinical signs, pathoanatomical changes, diagnosis, disease control, specific prophylaxis.

Streptococcosis is a group of infectious factorial diseases that affect mainly young animals of many species, caused by pathogenic streptococci and manifested in acute by septicemia and omphalitis, and in subacute and chronic - primary lesions of the lungs, joints, eves and other organs [13]. According to current data, streptococcosis leads to significant economic losses, especially in industrial pig production, thereby emphasizing the need to combat these diseases through vaccine treatment. But for pig enterprises there is a huge problem associated with the lack of modern and full-fledged means of specific prevention of this group of diseases. So, on the territory of the Russian Federation only 3 vaccines have been officially registered in December 2017, aimed to specific prevention of streptococcosis in piglets, namely: VERRES-SPS (Vetbiochim Ltd), Vaccines against salmonellosis, pasteurellosis and streptococcosis of piglets (FCS "Armavir Biofactory") and "Vaccine against respiratory diseases of pigs, polyvalent inactivated Donoban-10" (KBNP, INC.). While all three vaccines in the antigenic composition contain only components of Streptococcus suis of various serogroups. Since the number of authors have established that different types of streptococci do not have the possibility of forming a cross immune response, the given vaccines are not able to fully protect animals from streptococcosis caused by other species of this genus [2, 3, 9].

The solution of this problem, important for the Russian pig industry, can be the development of an effective modern vaccines with an extended antigenic composition of

streptococci, for the creation of which the primary task is to study the etiological profile of streptococcosis in the country.

The aim of the study was to investigate the prevalence of bacteria of the genus Streptococcus in industrial pig production in various regions of the Russian Federation and to determine the etiological structure of streptococcosis.

MATERIALS AND METHODS OF RESEARCH

The study was conducted on the basis of the All-Russian Scientific Research Institute of Experimental Veterinary Medicine named after Y.R. Kovalenko. Selection of pathological material was carried out at pig enterprises of Pskov, Moscow, Belgorod, Ulyanovsk, Tambov regions, and the Republic of Mordovia and Buryatia and the Stavropol Territory in 2015-2017. The material for the study was obtained from animals in the age group up to 45 days, since this group of animals is most susceptible to streptococcosis, manifested with typical clinical and morphological features, namely arthritis, lymphadenitis, meningitis, respiratory pathologies, fever, etc. Samples of parenchymatous organs, lungs, joints, lymph nodes, and brain were used as material for bacteriological analysis. In all cases, the number of animals, from which the material was studied, varied between 6 and 21 heads. Since streptococcosis has a mass character among certain age groups, we recognized the isolation of the streptococcus culture from one pig as circulating it among the entire population of the enterprise, i.e. not an isolated case.

During the complex laboratory diagnostics of streptococcosis, the following nutrient media were used: MPA with the addition of 5-10% of the sheep blood, MPB, columbia agar, broth core with bromocresol purple, cardiovascular broth, Müller-Hinton agar.

STREPTOtest 16 test systems were used to identify cultures of streptococci, as well as carbohydrates: adonitol, arabinose, galactose, D-glucose, dulcitol, inositol, inulin, xylose, lactose, maltose, mannitol, mannose, melibiose, raffinose, rhamnose, salicin, sorbitol, sucrose, trehalose, fructose, cellobiose from Himedia, using bromocresol purple broth as an indicator medium.

For the control of nutrient media and diagnosticums, reference cultures of microorganisms were used, which are at the disposal of the microbiology laboratory with the Museum of Typical Cultures of the FBBNU VIEV named after Ya.R. Kovalenko.

The study of the biological properties of cultures was carried out on the territory of the Vyshnevolotsky branch of the FGBICU VIEV named after Ya.R. Kovalenko with an experienced base about. Lysias. As biological model, white mice weighing 16-18 g were used.

RESULTS AND DISCUSSION

As a result of laboratory and diagnostic studies, we managed to isolate a number of streptococcal isolates from the sectional material from various Russian pig farms (Table 1).

As can be seen from Table 1, in the bacteriological study of samples of the sectional material from pigs with the clinical and morphological manifestation of streptococcosis, 13 types of streptococci were isolated and identified (group D streptococci were not included in the record, since according to the modern classification they belong to the genus Enterococcus). Analyzing obtained data, it can be noticed that several types of streptococci circulate at the same farm simultaneously, therefore the etiological role of each of these species should be established. Nevertheless, it was found that Streptococcus dysgalactiae and S. massiliensis were found in 50% of enterprises, Streptococcus porcinus, S. mutans and S. pyogenes in 37.5% of cases, Streptococcus agalactiae, S. gallolyticus, S. rubneri and S. uberis in 25% of cases, and Streptococcus iniae, S. lutetiensis, S. pneumoniae and S. suis in 12.5% of cases.

According to the literature data about the listed strains of streptococci that can cause pig diseases, Streptococcus dysgalactiae [8] Streptococcus porcinus [7], Streptococcus

pyogenes [2], Streptococcus suis [5, 12] and other streptococci were not noted as etiologically significant in the occurrence of streptococcosis at pig-breeding enterprises.

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		Pskov region	Moscow region	Belgorod region	Ulyanovsk region	Tambov Region	Republic of Mordovia	Republic of Buryatia	Stavropol region	Percentage of cases, %
1.	Streptococcus agalactiae	+				+				25
2.	Streptococcus gallolyticus				+				+	25
3.	Streptococcus dysgalactiae		+	+	+				+	50
4.	Streptococcus iniae						+			12,5
5.	Streptococcus lutetiensis					+				12,5
6.	Streptococcus massiliensis	+	+		+			+		50
7.	Streptococcus mutans		+	+			+			37,5
8.	Streptococcus pneumoniae			+						12,5
9.	Streptococcus porcinus					+	+		+	37,5
1(Streptococcus pyogenes	+				+		+		37,5
1	Streptococcus rubneri			+	+					25
1:	Streptococcus suis		+							12,5
1:	Streptococcus uberis			+		+				25

Table 1 – Results of the isolation of bacteria of the genus Streptococcus from piglets with signs of streptococcosis, in various regions of the Russian Federation*

* The isolates of streptococcus were preserved in the collection of microorganisms of the FBBNU VIEV named after Y.R. Kovalenko for further study.

For the final establishment of the etiological significance of all obtained streptococcal isolates, we tested the pathogenicity on white mice, as a biological model, under the conditions of the vivarium of Vyshnevolotsky branch of VIEV. To determine the pathogenic properties of each isolate, two experimental mice weighing 16-18 g were used, the total number of animals participating in the experiment was 68 heads, of which 58 were experimental and 10 were control. Mice were infected by subcutaneous injection of 0.5 cm³ of 24-hour streptococci culture grown on cardiovascular broth. The concentration of bacterial cells, due to a sterile physiological solution, was set at 3 billion mcd. cl. in 1 cm³. Observation of animals continued for 14 days or until the death of animals. The isolate was recognized as pathogenic in the case of death of both white mice, or in the development of signs of the disease in mice, followed by pathoanatomical dissection and isolation of a pure culture of streptococcus.

As a result of the work, it was established that all isolates of Streptococcus dysgalactiae, Streptococcus pyogenes, Streptococcus suis and Streptococcus porcinus possess pathogenicity. At the indicated concentration, mice died within 48-72 hours from the moment of infection, which is evidence of their special significance in the etiologic structure of streptococcosis in piglets, and emphasizes the need for further study of this problem.

CONCLUSION

The intensive development of the pig industry leads to the expansion of the spectrum of microorganisms circulating in the enterprise, leading to the development of the infectious process, which, first of all, is associated with the importation of a new, often foreign, livestock. A striking example of this conclusion is streptococcosis, the etiologically significant causative agent of which was previously considered Streptococcus suis, on the basis of which domestic vaccine preparations for the prevention of streptococcosis caused by this species were developed. Expanding the species composition of streptococci, clinically significant in animal diseases in pig breeding enterprises, requires urgent scientific research aimed at developing modern domestic drugs for specific prevention of streptococcosis [1, 4, 6, 10, 11, 14]. To determine the necessary antigenic composition of the vaccines, we studied the specific composition of streptococci circulating in a number of pig-breeding enterprises of the country. The obtained data underscore the advisability of creating a new vaccine for the prevention of streptococcosis, which includes Streptococcus dysgalactiae, S. pyogenes, S. porcinus and S. suis strains as antigens, since these species currently have a significant etiological significance in the territory of various regions of the Russian Federation. A single case of isolating the culture of Streptococcus suis, in 1 out of 8 enterprises, can be considered as an effective scheme for the prevention of streptococcosis caused by this type of pathogen by existing vaccines. That is why, to create a full-fledged and effective vaccine preparation, this type of streptococcus should be included in the antigenic composition of the biological product. Undoubtedly, the number of studied enterprises is limited, but the results sufficiently correspond to foreign data on the etiological structure of streptococcosis pathogens.

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