

Structure and Statistics of Mortality in Pig Feeding Groups on Industrial Type Farms in 2009-2019

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Abstract— The aim of the work was to diagnose diseases through autopsy and additional examinations and to determine the mortality structure and statistics in pigs of fattening groups on pig farms of industrial type. The objects of the study were 626 pigs from 15 pig «farrow-to-finish» farms in a number of regions of the European part of Russia. All animals were autopsied by the authors together with farm specialists in 2009-2019. Autopsy results in many cases are supplemented by the results of histological, bacteriological studies, ELISA studies, PCR. Over the entire period of the study of pigs in the fattening groups, streptococcosis, hypovitaminosis E - mycotoxicosis and actinobacillosis pleuropneumonia were most commonly diagnosed; intestinal inversion, enzootic pneumonia and gastric ulcer were somewhat less often. The absence of the viral causes of death, apart from the isolated cases of circovirus is indicative. When comparing the results of the study in the periods 2009-2015 and 2016-2019, attention is drawn to the increase in the frequency of cases of streptococcosis, intestinal inversion, cystitis and a sharp decrease in the frequency of cases of actinobacillosis pleuropneumonia. Changing indicators of the structure and mortality statistics for a number of years indicate the feasibility of pathological monitoring on pig farms, bearing in mind the constantly changing situation in diseases, depending on numerous factors affecting the number of animals.

Keywords—pig, statistics of mortality

I. INTRODUCTION

The efficiency of production on pig farms depends largely on the health of the raised livestock. The words of Polish scientist, specialist in pig diseases Sigmund Peysak are perceived as a postulate [1]: "with the growth of production and concentration of pig breeding, the role of a veterinarian increases, he should be responsible not only for the health of animals, but also for the epizootic well-being of pig farms in general. This applies to the diagnosis, therapy and prevention of diseases." In countries with developed pig breeding, for example, in Germany, Poland, much attention is paid to the pathological diagnosis in the form of autopsy and post-slaughter examination [2]. Constantly conducted qualified autopsy performs the function of systemic pathological monitoring and gives not only the opportunity to know the current situation on the structure of diseases on the farm, but also the opportunity to

summarize the results of the study for certain periods of time, to find out the change in the structure and statistics of diseases. It is known that big losses are observed due to pig deaths in groups of fattening where large amount of money is invested in cultivation of pigs within several months. [3]. The sources of information for the most part contain data on mortality and its causes in pigs before weaning [4, 5] and in sows [6-9], at the same time the information on mortality and its causes in pigs fattening groups is very rare [10, 11]. Moreover, the found articles present a number of reasons of generalizing, but not nosological type, for example, pathology of cardiovascular, genitourinary systems, intestines is presented. The apparent lack of information on the causes of death of fattening pigs in the sources of information should be considered as an indicator of the lack of a conceptual approach to the comprehensive diagnosis of diseases of fattening pigs. Based on this, we determined the purpose of the work: to diagnose the diseases that led to the death of fattening pigs by means of autopsy and additional studies, and to determine the structure and mortality statistics on pig farms of industrial type in a number of regions of the European part of Russia in 2009-2019.

II. EXPERIMENTAL

The object and material of the study were 626 pigs of fattening groups of 15 pig farms of industrial type in a number of regions of the European part of Russia. All animals were subjected to a diagnostic autopsy conducted by the authors together with specialists of farms in 2009-2019. The method of complete (complex) evisceration according to G. V. Shor was used in the pathological examination [12]. Autopsy results in many cases are supplemented by the results of histological, bacteriological, chemical-toxicological studies, ELISA studies, PCR. The obtained data were systematized according to the nosological principle and determined the mortality structure and statistics of pigs in fattening groups.

III. RESULTS AND DISCUSSION

By means of opening and additional researches the diseases which have led to death were diagnosed, structure and statistics of lethality in groups of fattening of pigs were determined. The diagnosis was based on pathological changes characteristic of a particular disease. Description and photographs of pathoanatomical changes characteristic

of a particular disease of pigs of fattening groups, accompanied by discussion and comparison with scientific publications in the sources of information, were previously presented in several articles [13-16]. In most cases, diseases are defined as nosological forms on the basis of pathognomonic pathoanatomical changes established at the autopsy. In some cases, the pathological diagnosis was clarified by the results of additional studies. Since the study covers a fairly long period of 11 years, we consider it to be appropriate to present the results for all years of the study from 2009 to 2019, and also individually for 2009-2015 and for the period 2016-2019. This review of the results allowed us to establish the constancy or variability of the structure and statistics of mortality in different years and made it possible to determine or assume the causes of variability. The results of the study are summarized in the table I.

As can be seen from the data summarized in the table, for the entire period of the study in pigs in the fattening groups, streptococcosis, hypovitaminosis E - mycotoxicosis and actinobacillosis pleuropneumonia were most often diagnosed; somewhat less often - intestinal inversion, enzootic pneumonia and gastric ulcer. Considering these diseases from the standpoint of etiology, it should be noted that 3 of the 6 diseases mentioned above, namely streptococcosis, actinobacillosis pleuropneumonia and enzootic pneumonia, are infectious, bacterial. Moreover, the carrier of bacteria-pathogens of these diseases is widespread among the livestock of industrial farms. In the etiology and pathogenesis of hypovitaminosis E - mycotoxicosis a leading role plays poor quality and defective feed composition, as mentioned above. Volvulus and gastric ulcer are "costs" features of intensive feeding, to some extent contrary to the physiology of pig digestion [13, 15]. According to the literature, the leading role in the etiology of volvulus (intestinal mesentery inversion) is assigned to feeding pigs with feed, which gives rapid, strong gas formation, leading to intestinal displacement, the so-called "hemorrhagic bowel syndrome" [18]. The lack of viral diseases among causes of death, apart from isolated cases of circovirus can be considered significant. The well-being of industrial-type pig farms for viral diseases is likely to be ensured by comprehensive anti-epizootic measures, including immunization with high-quality vaccines. When comparing the results of the study in the periods 2009-2015 and 2016-2019, attention is drawn to the increase in the frequency of cases of streptococcosis, intestinal inversion or volvulus, cystitis and a sharp decrease in the frequency of cases of actinobacillosis pleuropneumonia. The decrease in the incidence of actinobacillosis pleuropneumonia, obviously, also occurred due to a complex of anti-epizootic measures, including immune prophylaxis and antibiotic therapy. For comparison, we give an example of the structure and mortality statistics in fattening pigs on a large farm in the United States [5]. Pneumonia-24,7%, gastric ulcer-14,0%, enteritis-6,4%, trauma-4,3%, volvulus - 4,3%, stricture of the rectum-3,2%, stress syndrome-3,2%, encephalitis-2,2%, other-6,5%, without diagnosis-31,2%. As can be seen from the data presented in the American article on the structure and statistics of mortality on the farm, the figures differ significantly from our data. This difference, along with the changing indicators of the structure and mortality statistics for a number of years in our study, once again points to the feasibility of pathological monitoring on pig farms, bearing

TABLE I. MORTALITY STRUCTURE AND STATISTICS OF PIGS IN FATTENING GROUPS ON INDUSTRIAL FARMS IN 2009-2019 YEARS

№	Mortality structure	Mortality statistics of pigs in different periods					
		2009-2015 years		2016-2019 years		2009-2019 years	
		n	%	n	%	n	%
1.	Streptococcosis	40	13,6	57	17,3	97	15,5
2.	Circovirus infection	12	4,0	7	2,1	19	3,0
2-a	Circovirus and streptococcal infection *	8	2,7	-	-	8	1,3
3.	Staphylococcosis	2	0,8	-	-	2	0,3
4.	Atrophic rhinitis	-	-	2	0,6	2	0,3
5.	Actinobacillosis pleuropneumonia	62	21,0	4	1,2	66	10,5
6.	Enzootic pneumonia (Mycoplasmosis)	18	6,1	26	7,9	44	7,0
7.	Dysentery	12	4,0	4	1,2	16	2,6
8.	Lawsoniosis (Proliferative enteropathy)	6	2,0	10	3,0	16	2,6
9.	Hypovitaminosis E - mycotoxicosis **	48	16,2	43	13,0	91	14,5
10.	Stress syndrome	14	4,6	18	5,4	32	5,1
11.	Bronchopneumonia	16	5,4	25	7,6	41	6,5
12.	Pleurisy	4	1,5	14	4,2	18	2,9
13.	Peritonitis	2	0,8	16	4,8	18	2,9
14.	Gastric ulcer	20	6,8	23	6,9	43	6,9
15.	Gastroenteritis	7	2,4	14	4,2	21	3,4
16.	Volvulus	12	4,0	33	10,0	45	7,2
17.	Prolapse of rectum	-	-	4	1,2	4	0,7
18.	Cystitis	9	3,0	25	7,6	34	5,4
19.	Nephritis	2	0,8	-	-	2	0,3
20.	Injury	-	-	5	1,5	5	0,8
21.	Inguinal hernia	1	0,3	1	0,3	2	0,3
	Bcero	295	100%	331	100%	626	100%

*. * During the pathoanatomic examination, detection of genome of porcine circovirus (CVC2) and isolation of hemolytic *Streptococcus suis*, in 8 Landrace pigs aged 120-130 days the associative circovirus and streptococcal infection were diagnosed. At autopsy, gross lesions were determined: enlargement of the spleen, lymph nodes, characteristic of both diseases; serous-fibrinous, fibrinous and fibrinous-hemorrhagic pericarditis, warty endocarditis, typical for streptococcosis; red rash in the skin, "large speckled" kidney inherent circovirus. Histological examination revealed microscopic lesions that can be qualified as pathognomonic for this associative infection: inflammation of the epicardium with serous leukocyte exudation and colonies of streptococci in the exudate on the valves, characteristic of streptococcosis, as well as proliferation of macrophages in the spleen and lymph nodes in the form of epithelioid and giant cell transformation, typical for circovirus.

** Hypovitaminosis E (mycotoxicosis) - pigs were found to have a complex of pathological changes typical for mycotoxicosis and hypovitaminosis E: catarrhal, hemorrhagic, necrotizing, erosive gastritis, toxic liver dystrophy, granular dystrophy and necrosis of the heart muscle. Anamnestic data were taken into account: no sorbents of mycotoxins and (or) antioxidants were added to livestock feed during the study period. The periodic chemical-toxicological examinations found T-2 toxin of fungi of the genus *Fusarium* and aflatoxins of fungi of the genus *Aspergillus* in feed. Histological examination of myocardial sections revealed extensive areas of granular dystrophy and Zenker necrosis of myocardiocytes. Such macroscopic and microscopic changes, along with mycotoxicosis, are described in the absence of selenium and vitamin E in the feed, which play the role of antioxidants. The similarity of macroscopic and microscopic changes in mycotoxicosis and the lack of selenium and vitamin E is explained by the relationship of these substances in the body of animals. The first option: in annualized rate in the body there is no mycotoxins, there are enzymes, containing selenium, and vitamin E in quantities, sufficient to defuse conventional number of free radicals. In this case, there is no pathological changes in the organs. The other option: derived mycotoxins with feeds, there are enzymes, containing selenium, and vitamin E in quantities, sufficient to defuse conventional number of free radicals, but already insufficient to defuse conventional number of free radicals, and mycotoxins. There will be changes typical of mycotoxicosis described above. The third option: no mycotoxins, no enzymes containing selenium, and vitamin E in quantities sufficient to defuse the usual amount of free radicals. In this case, there are changes typical of hyposelelenosis and hypovitaminosis E, similar to the changes described above in mycotoxicosis, except for inflammation of the stomach.

in mind the constantly changing situation of diseases, depending on numerous factors affecting the number of animals.

IV. CONCLUSION

During the entire period of the study, the pigs in the fattening groups were most often diagnosed with streptococcosis, hypovitaminosis E-mycotoxicosis and actinobacillosis pleuropneumonia; somewhat less often - intestinal inversion, enzootic pneumonia and gastric ulcer. Indicative of the absence of viral diseases among the causes of death, apart from isolated cases of circovirus can be considered significant. When comparing the results of the study in the periods 2009-2015 and 2016-2019, attention is drawn to the increase in the frequency of cases of streptococcosis, intestinal inversion, cystitis and a sharp decrease in the frequency of cases of actinobacillosis pleuropneumonia. Changing indicators of the structure and mortality statistics of pigs for a number of years indicate the feasibility of pathological monitoring on pig farms, bearing in mind the constantly changing situation of diseases, depending on numerous factors affecting the number of animals.

REFERENCES

- [1] Z. Pejsak, Diseases of swine. Brest: Brest printing house, 2008, 7 p.
- [2] Z. Pejsak, Health Protection of pigs. Brest, Polygraph, 2012, pp. 506-537.
- [3] E. Luchkina, A. Fedorova, "Analysis of animal mortality at the pig-breeding enterprise of the Amur region," Proceedings of the 3rd International scientific and practical conference, Vestnik Krasgau, p. 218, 2015.
- [4] A. Crooks, H. Hurd, D. Dargatz, G. Hill, "Economic cost of preweaning mortality: a report of the NAHMS national swine survey," Swine Health Prod., vol. 1, pp. 15-21, 1993.
- [5] R. Tubbs, H. Hurd, D. Dargatz, G. Hill, "Pre-weaning morbidity and mortality in the United States swine herds," Swine Health Prod., vol. 1, pp. 21-27, 1993.
- [6] M. Chagnon, S. D'Allaire, R. Drolet, "A prospective study of sow mortality in breeding herds," Can. J. Vet. Res., vol 55, pp. 180-184, 1991.
- [7] G. Christensen, L. Vraa-andersen, J. Mousing, "Causes of mortality among sows in Danish pig herds," Veterinary Record, vol 137, pp. 395-399, 1995.
- [8] . H. Karg, G. Bilkei, "Causes of sow mortality in Hungarian indoor and outdoor pig production units," Berliner und Munchener tierarztlische Wochenschrift, vol 115, pp. 366-368, 2002.
- [9] T. Stein, A. Dijkhuizen, S. D'Allaire, R. Morris, "Sow culling and mortality in commercial swine breeding herds," Prev. Vet. Med., 9, pp. 85-94, 1990.
- [10] D. Maes, A. Larriestra, J. Deen et al., "A retrospective study of mortality in grow-finish pigs in a multi-site production system," J. Swine Health Prod., vol 9, pp. 267-273, 2001.
- [11] B. Straw, G. Neubauer, A. Leman, "Factors affecting mortality in finishing pigs," J. Am. Vet. Med. Assoc., vol 183, pp. 452-455, 1983.
- [12] J. Torrison, The pig necropsy. Diseases of swine, J.J. Zimmerman, Ed. Ames, Iowa: Wiley-Blackwell, 2012, pp. 69-76.
- [13] V. Balabanova, A. Kudryashov, "Intestinal Inversion and other causes of sudden death of fattening pigs," Actual Questions of Veterinary Biology, vol. 3, pp. 63-69, 2018.
- [14] V. Balabanova, A. Kudryashov, Zh. Ustenko, "Organopathology of streptococcosis of pigs of fattening group," International Journal of Veterinary Medicine, vol. 2, pp. 10-14, 2018.
- [15] A. Kudryashov, Yu. Gankina, "Pathomorphological changes in pigs with mycotoxicosis", Actual Questions of Veterinary Biology, vol. 3, pp. 28-30, 2009.
- [16] A. Kudryashov, A. Musin, V. Balabanova, T. Maksimov, "Pathological changes in staphylococcosis of piglets in the groups of rearing and fattening," Actual Questions of Veterinary Biology, vol. 2, pp. 55-59, 2018.
- [17] J. Thomson, R. Friendship, The stomach: gastric ulceration. Diseases of swine, J. Zimmerman, Ed. Ames, Iowa: Wiley-Blackwell, 2012, pp. 208-211.
- [18] J. Thomson, R. Friendship, Intestinal torsion and hemorrhagic bowel syndromes. Diseases of swine, J. Zimmerman, Ed. Ames, Iowa: Wiley-Blackwell, 2012, pp. 214-215.