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Features Of The Immunobiological Status Of Piglets With Associated Bacterial Gastrointestinal Infections.

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ABSTRACT

One of the most significant problems in the pig-breeding industry of the Russian Federation is the reduction in the incidence and mortality of piglets in the postnatal and post-harvest periods from sows, infections with a primary lesion of the gastrointestinal tract, aetiologically caused by associations of pathogenic strains of Escherichia coli, enterococci, blue pus, enterovirus, and other strains of E. coli, enterococci, S. p. microorganisms [5]. In connection with the development of pig breeding, studies on the immunity indicators of the body of piglets are of great importance in order to develop means and methods for the prevention of infectious diseases. The urgency of the problem being studied is due to the insufficient immunobiological status of piglets in the early postnatal period of development. This is especially manifested in individuals who have had infectious diseases inability to realize the genetically programmed capabilities of the organism. The short duration of the clinical manifestation of these infections also makes it difficult to timely diagnose these diseases in life, in this regard, studies aimed at identifying lagging immunity in the sick piglets are of considerable scientific and practical interest. The purpose of this work was to study the features of the immunobiological status of clinically healthy and infected Escherichia coli, Enterococcus faecalis, Pseudomonas aeruginosa piglets of the suckling and weaning growing period. Determining the critical period of immune system tension at 35 days of age in piglets who have had an infectious disease with a clinic of diarrhea will help develop a set of preventive means and measures to prevent these infections in pig breeding.

Keywords: immunobiological indicators, associations, microorganisms, infections, gastrointestinal tract, piglets.

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INTRODUCTION

The immune system of animals in the postnatal period of development of the organism plays a special role in maintaining morphological and functional homeostasis [1]. In the postnatal period, in order to effectively protect against etiological pathogenic factors, animals should have a high level of resistance and immunobiological reactivity [6]. The insufficiency of the immune system, due to the morphological and physiological features of the body of piglets, is one of the main causes of increased morbidity and mortality of suckling pigs and weanings from diseases of bacterial etiology [6]. Infectious gastrointestinal diseases of bacterial etiology create a particular problem in pig farms of various forms of property with the associated infection of piglets with pathogenic strains of intestinal and blue pus bacillus, enterococci and non-systemic use of antibiotics [2, 4, 5]. In this regard, conducting studies on the immunobiological status of the body of piglets and its features in the suckling and weaning periods are relevant and allow not only to correct preventive measures for the associative manifestation of infectious gastrointestinal diseases of animals, but also to prevent foodborne infections [3, 8].

MATERIL AND METHODS

Studies were conducted in the agricultural enterprise and veterinary laboratories of the Krasnodar Territory. To carry out experiments on the principle of steam-analogs from sows of a large white breed, 10 heads of suckling pigs with clinical signs of diarrhea syndrome were selected from nests unfavorable for infectious diseases. As a control, 10 clinically healthy piglets were taken from sows from prosperous nests. Microbiological studies on the presence of the causative agents of colibacillosis, pseudomonas and enterococcal infection were carried out in accordance with the methodological guidelines for laboratory diagnosis: streptococcosis (1990), pseudomonosis of animals and birds (1988), colibacteriosis (escherichiosis) of animals (1991). Hematological parameters in piglets at 25, 35, 40, 45 days after birth were studied on a Celli-70 device (France), the concentration of immunoglobulins on a Homolaizer-2000 biochemical analyzer (Austria). Definition: T, B, NK lymphocytes were produced according to Pierce, 1962, modification N.N. Gugushvili, 2000, E-ROCK lymphocytes according to P.V. Petrov, 1992, EAK-ROCK B-lymphocytes using rosetting according to GushchinY .S., 1981. Functional activity of neutrophils: phagocytic activity of neutrophils, phagocytic number, neutrophil activity coefficient, phagocytic blood capacity, phagocytic index,% digestibility, phagocytosis completeness index according to Nesterova IV, Kolesnikova NV, Chudinova G .A., 1989, in the modification Gugushvili N.N., 2000.

RESULTS AND DISCUSSION

As a result of the research it was found that piglets from nests unfavorable for gastrointestinal infections have a significantly low content before weaning compared to their peers from safe nests of the relative and absolute number of lymphocytes by reducing the number of T-lymphocytes by 16.3% (tab. 1). In the subpopulation composition of T-cells there was a drop in the number of T-suppressors to 11.3 ± 2.49% and was 1.3 times lower ($p < 0.05$), compared with healthy piglets and the content of young B-lymphocytes 13, 0 ± 3.38%. With a decrease in lymphocyte quantitative indices, their functional activity decreased, which can be judged by the presence of active forms of T-cells (Ea-ROCK) in peripheral blood and the level of gamma globulins, whose content was within 26.8 ± 3.03 and 16, 1 ± 1.4%, respectively, while in piglets from healthy nests, these indicators were 28.8 ± 3.89 and 18.1 ± 0.95%.

Table 1: The immune status of piglets from safe and unsafe nests, before and after weaning from sows (n = 10)

Indicators	Piglets from good flock				Piglets from bad flock			
	Age of animals, day							
	24	35	40	45	25	35	40	45
The absolute number of lymphocytes, 10^9 / l	8,2	8,6	9,4	7,9	6,7	7,1	7,3	7,4
E-ROCK,% (T-lymphocytes)	42,9	39,7	39,1	48,9	36,9	35,4	32,9	37,8
The absolute number of T-lymphocytes 10^9 / l	3,5	3,4	3,7	3,9	2,4	2,5	2,4	2,8
Tfr-Rock (T-helper),%	28,0	26,7	26,7	31,9	25,6	25,3	23,5	22,3
Tfch-Rock (T-suppressors),%	14,9	14,9	13,0	17,0	11,3	9,1	9,4	15,5

TfrRock / TfchRock	1,9	2,1	2,1	1,8	2,4	3,4	2,8	1,5
Ea-ROCK (T-active),%	28,8	27,4	27,8	28,9	26,8	26,8	23,6	23,2
Leukot Cell Index (LTI)	3,7	4,4	4,1	3,9	4,5	4,9	4,6	4,9
EAK-ROCK (B-lymphocytes),%	28,9	28,3	27,0	25,6	25,8	24,7	23,2	21,7
M-rock (V-young),%	54,3	8,2	9,3	11,6	13,0	8,8	10,3	10,0
The absolute number of B-lymphocytes, 10^9 / l	2,4	2,4	2,6	2,0	1,8	1,8	1,7	1,6
Gammaglobulins,%	18,1	19,4	19,4	18,5	16,1	14,2	13,2	16,7

Prior to weaning in piglets infected with Escherichia coli, Enterococcus faecalis, Pseudomonas aeruginosa from dysfunctional nests, combined (T, B-cell and phagocytic) immunodeficiency, which predisposed to the development of intestinal infections, took place. On the day of weaning in piglets of both groups (35 days old), a decrease in the relative and absolute number of T-lymphocytes was noted. However, in animals from dysfunctional infected nests, these indicators, respectively, by 12.1% and 35.2% ($p < 0.05$) were lower than in piglets from healthy nests, and therefore the immunodeficiency of T-lymphocytes was more pronounced. This is indicated by an 11.4% ($p < 0.05$) leuko-T-cell index. Along with the total number of T-cells, the number of active T-lymphocytes (Ea-ROCK) decreased, the level of which in pigs from healthy nests was 27.4 ± 2.24%, and in animals from disadvantaged - 23.8 ± 4.28% . In sick animals, there was a tendency to decrease T-suppressors, in connection with which the immunoregulatory index (Tx / Tc) increased to 3.4 ± 1.46, in healthy piglets the index was at a level of 2.1 ± 0.36.

Studies have established that in pigs at 35 days of age there was a fairly pronounced immunodeficiency in the T-cell unit. This circumstance is explained by the physiological immaturity of the body's immune system in piglets at this age and the effects of stress. At 35 days of age, animals from dysfunctional nests showed a decrease in the relative number of B-lymphocytes and their functional activity, as well as a low level of gamma globulins, these figures were significantly lower by 14.6% and 36.6%, respectively ($p < 0,05$).

In piglets from dysfunctional nests (Table 2) before weaning, the relative number of phagocytic neutrophils was lower by 6.4% and their absolute number was 29.4%. Phagocytic digesting ability was higher in the piglets from the prosperous nests (69.7%) than in the disadvantaged (66.9%).

Table 2: Changes in phagocytic immunity parameters in piglets from prosperous and dysfunctional nests in the pre and post-weaning period

Indicators	Piglets from good flock				Piglets from bad flock			
	Age of animals, day							
	24	35	40	45	25	35	40	45
Phagocytic activity of neutrophils,%	55,0	56,0	58,0	60,0	51,7	45,0	47,7	52,7
Phagocytic number	2,4	2,7	2,3	3,1	2,5	3,4	3,0	3,0
Neutrophil activity coefficient, 109 / l	2,2	2,8	2,5	3,6	1,7	1,9	1,2	2,7
Phagocytic blood capacity, 109 / l	9,7	13,3	12,7	18,9	8,5	15,1	7,9	15,7
Phagocytic index	1,3	1,6	1,4	1,5	1,3	1,6	1,2	1,2
% digestibility	69,7	66,6	64,4	67,7	66,9	52,3	49,1	63,0
Phagocytosis Completion Index	0,9	1,0	1,2	1,3	1,1	1,1	1,1	1,2

In sick pigs, the tendency of pathological changes on the part of the immune system was exacerbated. So significantly decreased: the total number of T-lymphocytes to 32.9 ± 3.62%, and their active forms to 23.6 ± 4.52%; B lymphocytes up to 23.2 ± 4.04; gamma globulins up to 13.2 ± 1.80%; neutrophil phagocytic activity up to 47.7 ± 2.10%; phagocytic capacity up to 1.24 ± 0.05 109 / l. In piglets from successful nests, the level of immunity parameters did not change.

By the age of 45 days, piglets from successful nests in the blood showed an increase in the number of T-lymphocytes, the content of B-lymphocytes slightly decreases, the level of gamma globulins in the blood serum remains stable (18.5 ± 1.13-19.2 ± 1, 71%). Phagocytic activity of neutrophil granulocytes also increased. In piglets from dysfunctional nests that had had infections, an increase in the level of T-lymphocytes was

recorded; phagocytes; gamma globulins. The content of B-lymphocytes decreased to 1.60 ± 0.2910% and 21.7 ± 2.45% (by 25.0% and 17.9%) than in healthy piglets.

CONCLUSION

In the piglets who have had diarrhea caused by infection with E. coli, P. aeruginosa, E. faecalis at an early age, a pronounced immunodeficiency state is formed in the T-cell and phagocytic unit. On the day of weaning of piglets, T-cell immunity continues to decline, a violation of the functional activity of B-lymphocytes appears, the number of active phagocytes decreases, their exciting and digesting ability. A pronounced combined immunodeficiency was noted by 5-7 days of weaning. By 45 days of age, immunity indicators were restored.

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