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EFFICACY OF TREATMENT OF PIGLET GASTROENTERITIS

ЧОЧКОНУН ГАСТРОЭНТЕРИТИН ДАРЫЛООНУН НАТЫЙЖАЛУУЛУГУ

ЭФФЕКТИВНОСТЬ ЛЕЧЕНИЯ ГАСТРОЭНТЕРИТА ПОРОСЯТ

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Abstract

The aim of the research was to study the comparative effectiveness of therapeutic methods of treatment of gastro-enteritis in piglets. Piglets of large white breed, 3-5 days old, with clinical signs of gastroenteritis were selected for research. The sick piglets were formed into three groups. In piglets of the control group, when using Butofan metab-olism stimulator, the duration of the disease was $7,4 \pm 0,2$ days, average daily live weight gain - $180,0 \pm 6,3$ g, safety was 60%. In piglets of the second group, when using complex treatment with antibiotic Amoxilong™ 150 LA and Butofan metabolism stimulator, the duration of the disease was $4,2 \pm 0,3$ days, average daily live weight gain - $231,8 \pm 4,4$ g, safety was 100%. In piglets of the third group, at application of complex treatment with antibiotic Ditrin and metabolism stimulator Butofan, duration of the disease was $5,5 \pm 0,23$ days, average daily live weight gain was $198,3 \pm 6,2$ g, safety was 80%.

Keywords: piglets, gastroenteritis, treatment, Butofan, Amoxilong™ 150 LA, Ditrin

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Аннотация

Изилдөөнүн максаты чочколордун гастроэнтериттерин дарылоо ыкмаларынын салыштырмалуу натыйжалуулугун изилдөө болгон. Изилдөө үчүн гастроэнтериттин клиникалык белгилери бар, 3-5 күндүк чоң ак тукумундагы чочколору тандалып алынган. Оорулуу чочколорду үч топко бөлүштү. Контролдук топтун чочколорунда метаболизмдин стимулятору Бутофан колдонгондо оорунун узактыгы $7,4 \pm 0,2$ сутка, орточо суткалык тирүү салмак кошуусу $180,0 \pm 6,3$ г, аман калуу көрсөткүчү 60% түздү. Экинчи топтогу чочколордун Амоксилогн™ 150 LA антибиотика жана метаболизмди стимулятору Бутофан менен комплекстүү дарылоону колдонууда оорунун узактыгы $4,2 \pm 0,3$ күн, орточо суткалык тирүү салмак кошуусу $231,8 \pm 4,4$ г, жашоо көрсөткүчү 100% болгон. Дитрим антибиотиктин жана метаболизмдин стимулятору Бутофанды колдонуу менен комплекстүү дарылоону колдонуу учурунда үчүнчү топтогу чочколордо оорунун узактыгы $5,5 \pm 0,23$ күндү түздү, тирүү салмактын орточо суткалык өсүүсү $198,3 \pm 6,2$ г, аман калуу көрсөткүчү 80%ды түздү.

Abstract

Целью исследований явилось изучение сравнительной эффективности методов лечения гастроэнтерита поросят. Для проведения исследований были отобраны поросята крупной белой породы, возраста 3-5 дней, с клиническими признаками гастроэнтерита. Больных поросят формировали в три группы. У поросят контрольной группы при применении стимулятора обмена веществ Бутофан длительность заболевания составила $7,4 \pm 0,2$ дня, среднесуточные приросты живой массы – $180,0 \pm 6,3$ г, сохранность составила 60%. У поросят второй группы, при применении комплексного лечения с использованием антибиотика Амоксилогн™ 150 LA и стимулятора обмена веществ Бутофан, длительность заболевания составила $4,2 \pm 0,3$ дня, средне-суточные приросты живой массы – $231,8 \pm 4,4$ г, сохранность составила 100%. У поросят третьей группы, при применении комплексного лечения с использованием антибиотика Дитрим и стимулятора обмена веществ Бутофан, длительность заболевания составила $5,5 \pm 0,23$ дня, среднесуточные приросты живой массы – $198,3 \pm 6,2$ г, сохранность составила 80%.

Ачкыч сөздөр: торопой, гастроэнтерит, дарылоо, Бутофан, Амоксилогн™ 150 LA, Дитрим

Ключевые слова: поросята, гастроэнтерит, лечение, Бутофан, Амоксилогн™ 150 LA, Дитрим

Introduction

Modern pig breeding is developing not by increasing the number of animals, but by increasing pork production. This is achieved through successes in breeding work, a high level of reproduction, the use of hybridisation and intensive methods of fattening. The efficiency of pig breeding intensification depends largely on the quality of young stock, which determines the growth rate, weight gain and overall economic profitability of pork production (Khakhula et al., 2020, pp. 29-35; Wang et al., 2023, p. 106441).

According to official data, in recent years between 48,5 and 52,3 per cent of pigs have suffered from non-communicable diseases, with gastrointestinal diseases accounting for 16,8 to 48,0 per cent of all cases. Among the dead animals, digestive diseases account for 48,6-48,7 per cent. Gastrointestinal diseases account for 51,1-52,5% of the total number of dead young animals (Bershakov et al., 2021, p. 8).

The main factors contributing to the development of gastritis in piglets are stress, unbalanced nutrition and poor housing conditions. Abrupt feed changes, dietary disturbances, as well as vitamin and microelement deficiencies can cause inflammatory processes in the gastric mucosa. Studies in the field of microbiology show that opportunistic microorganisms may also contribute significantly to the development of gastritis (Bushev et al., 2024, pp.112-114; Syromyatnikov et al., 2024, pp.80-81; Tuchkov et al., 2024, pp.474-476).

Symptoms of piglet gastroenteritis vary from minor digestive disorders to severe disorders, which requires careful diagnosis (Kuryatova et al., 2021, pp. 90-96). Thus, Gorshkova E.V. et al. (2024, pp. 51-56) studied gastrointestinal complexes of fallen and diagnostically killed fattening piglets with symptoms of digestive system diseases. When examining the complexes «stomach - small and large intestine» of piglets, characteristic pathological and anatomical changes were detected. Histological examination of gastroenterocolitis revealed inflammatory hyperaemia of blood vessels of microcirculatory channel in mucous and submucous layers, their impregnation with exudate, hypersecretion of mucus by goblet cells, their desquamation.

Zuev N.P. et al. (2022, pp. 42-44) studied clinical and morphological changes in piglet gastroenteritis. On the basis of pathological anatomical autopsy of fallen and compulsory killed pigs it was found that the total lesion of the cardiac part of the stomach (hyperkeratosis, erosions, acute and chronic ulcers) in all age groups is 67,0 %, and of the fundal part – 33,0 %. The greatest mortality is observed among animals aged 55-70 days, and forced slaughter in piglets of 80-106 days of age and in most cases with the presence of ulcers of the oesophageal region, which are much slower to undergo reparative processes.

Timely and accurate identification of the problem is crucial for successful treatment and improvement of the animal's condition. The main therapies include optimising the diet and improving housing conditions. Antibiotics have traditionally played a key role in the treatment of gastroenteritis, but their frequent use leads to reduced therapeutic efficacy (Esikova et al., 2021, pp. 90-96; Napolov et al., 2023, pp. 121-124).

Gertman A.M. et al. (2021, pp. 390-394) presented the results of studying the effectiveness of a therapy scheme for piglets with gastroenteritis in farm conditions. 18 piglets of large white breed aged 2-2.5 months, sick with gastroenteritis were divided into two groups - control and experimental. The control piglets were administered intramuscular dorin solution for five days. The piglets of the

experimental group were administered feed with Kormomix and 5% Baytril solution intramuscularly for three days. During fourteen days, all animals were monitored, and the terms of recovery and appetite recovery were evaluated. In the experimental group the normalisation of clinical status took place in a shorter period of time. Morpho-biochemical blood parameters were significantly higher in experimental piglets. Biochemical parameters indicate the recovery of protein-synthetic and other liver functions in this group of animals.

Gotovsky D.G. et al. (2024, pp. 81-86) studied the therapeutic efficacy of the veterinary preparation «Gentamin 10%». The veterinary preparation «Gentamin 10%» was administered to piglets of the experimental group as an etiotropic (antimicrobial) agent according to the temporary instruction, orally at the rate of 2,2 g per 10 kg of weight for 5 consecutive days with drinking water. In the control group piglets were administered veterinary preparation «Colisulfatril» as an etiotropic (antimicrobial) agent according to the instructions for use. It was found that the application of the veterinary drug «Gentamin 10%» showed positive dynamics of recovery in most animals. Already in three days in 18 piglets there was a decrease in the intensity of diarrhoea, and on the 4th-5th day all piglets of the experimental group showed disappearance of the main clinical sign of gastroenteritis - diarrhoea, as well as restoration of appetite and normalisation of water intake. Duration of gastroenteritis disease in the gastroenteritis group was $3,7 \pm 0,3$ days. At application of veterinary preparation «Kolisuftotril» positive similar dynamics was also observed. Already in three days in 16 piglets there was a decrease in the intensity of diarrhoea, and on the 4-5 day all piglets of the experimental group showed disappearance of the main clinical sign of gastroenteritis - diarrhoea. The duration of gastroenteritis in the group was $3,6 \pm 0,2$ days. No piglet deaths were observed in the experimental and control groups. No side effects were detected when using the preparations. The therapeutic effect was 100,0 %. No complications and side effects were observed during treatment. Addition of the drug to the feed did not lead to a decrease in eatability.

Studies on the use of antacid and enveloping agents as well as probiotics and prebiotics for the treatment and prevention of piglet gastroenteritis deserve attention. Probiotics contribute to the elimination of pathogens without adversely affecting the environment. They improve digestion by stimulating the growth of beneficial microflora, strengthen the immunity of animals and contribute to their productivity (Belko et al., 2020, pp. 4-8). The development of biopreparations based on probiotic microorganism strains synthesising biologically active substances (metabiotics) in the gastrointestinal tract of animals and promoting the development of normal microflora seems to be topical (Popov et al., 2020, pp. 130-135; Liufu et al., 2024., p. 458).

Shubina T.P. et al. (2023) conducted an experiment on the effect of biologically active supplement «Emprobio» on clinical condition and biochemical blood parameters in the treatment of gastroenteritis in piglets of dairy period. Piglets of the milk period at the age of 30-35 days with a live weight of 11-14 kg were selected for the experiment. Three groups of animals were created according to the principle of analogues. Clinically healthy animals were in the control group. The sick animals were divided into two experimental groups. In the first experimental group the animals were treated according to the farm scheme: Amoxicillin 150 - 1ml/10 kg and Tetravit 1ml/10 kg. In the second experimental group, in addition to this treatment, they were given the bio-additive «Emprobio». The preparation «Emprobio» was drunk with water at the rate of 2 ml per head 2 times a day for 10 days. The researchers showed that the use of the biopreparation «Emprobio» for the treatment of gastroenteritis in piglets of milk period has a positive effect on clinical and biochemical blood parameters, normalises metabolism and general condition.

This team also studied the effect of biopreparation «Vetom 1» on clinical and biochemical blood parameters of pigs with gastroenteritis. The experiment was carried out on 39 piglets of the milk period (30-35 days) of the Large White breed with live weight of 13-15 kg, sick with gastroenteritis. Three groups of 13 animals in each group were created: control (healthy), first and second experimental groups. The first experimental group received standard treatment according to the scheme of the farm, the second experimental group additionally received bio-additive «Vetom1». After treatment, the number of haemoglobin, erythrocytes, lymphocytes and segmented neutrophils in animals of the second group had higher values than in animals of the first group. The results obtained allow us to conclude about the positive effect of the bio-additive on haematological parameters and recommend it for the prevention and treatment of gastroenteritis (Shubina et al., 2024).

A.L. Sepp et al. (2020, pp. 74-90) studied the effect of probiotic strain *Enterococcus faecim L3* on microbiota composition and activity of digestive enzymes of the intestine in gastroenteritis in piglets during the weaning period. The obtained results of research indicate that oral application of probiotic strain *E. faecium L3* on the background of intestinal dysbiosis promotes faster restoration of enzymes involved in the final hydrolysis of proteins, fats and carbohydrates, as well as a pronounced dynamics of intestinal microbiocenosis restoration in animals. In piglets with gastroenteritis in 14 days from the beginning of *Enterococcus faecim L3* application in the intestinal microbiota there was a decrease in the content of *Escherichia coli* and an increase in the content of lactobacilli and enterococci (in comparison with the control group of animals). At the same time, the activity of a number of intestinal digestive enzymes (α -amylase, maltase, aminopeptidase N) increased and alkaline phosphatase activity decreased. Thus, the use of probiotic preparation based on *Enterococcus faecim L3* strain in piglets during weaning period restores the composition of intestinal microbiota and increases the activity of key intestinal digestive enzymes, which accelerates the adaptation of animal organism to a new type of feeding, positively affects metabolic processes, stimulates animal growth.

Thus, digestive diseases occupy a significant place among the pathologies of young pigs. These diseases cause huge economic damage to pig breeding, as productivity is reduced and animal weight gain decreases. For treatment and prevention of gastrointestinal tract diseases different medicines and treatment schemes are used.

In this regard, the aim of the research was to evaluate the effectiveness of methods of treatment of gastroenteritis of piglets.

The research work was carried out in a pig-breeding enterprise of the Republic of Bashkortostan.

The object of the study were 3- 5-day-old large white piglets with gastro-intestinal disorders.

To determine the therapeutic efficacy of complex treatment of gastroenteritis of piglets by the method of analogues, piglets of large white breed, 3-5 days old, with clinical signs of gastroenteritis were selected. The sick piglets were formed into three groups of 5 animals each.

The piglets of the control and experimental groups were kept under the conditions of the accepted housing and feeding technology (Table 1).

Table 1 *Schematic of the research experience*

Animal group (n=5)	Drugs used
1 control	Butofan (1 ml per animal, subcutaneously, for 5 days) + Ferran (on the 4th day after birth, 1 ml per animal, intramuscularly, for prevention of alimentary anaemia in piglets)
2	Amoxilong™ 150 LA (0,1 ml per 1 kg of animal weight, subcutaneously, once) + Butofan (1 ml per animal, subcutaneously, for 5 days) + Ferran (on the 4th day after birth, 1 ml per animal, intramuscularly, for prevention of alimentary anaemia in piglets)
3	Ditrim (0,1 ml per 1 kg of animal weight, intramuscularly in the neck area, for 3-7 days) + Butofan (1 ml per animal, subcutaneously, for 5 days) + Ferran (on the 4th day after birth, 1 ml per animal, intramuscularly, for prevention of alimentary anaemia in piglets)

The following parameters were considered in sick piglets:

1. Results of haematological and biochemical studies. For determination of haematological and biochemical blood parameters in piglets of control and experimental groups on the first day and on the 3rd and 7th days from the beginning of treatment blood was taken from the tail vein.

Haematological parameters were determined on an automatic haematological analyser URIT - 3020 (erythrocytes, leucocytes and haemoglobin content), biochemical studies were carried out on a semi-automatic biochemical analyser BIOCHEM SA (total protein, globulins).

2. The therapeutic efficacy of complex treatment in the control and experimental groups was evaluated by the following indicators:

- presence of positive dynamics (daily assessment of the clinical condition of piglets taking into account the general condition (temperature, pulse, respiration), presence/absence of diarrhoea);
- duration of treatment, days;
- safety, %.

3. Body weight gain of piglets under different treatment schemes. Live weight gain of sucklings was determined by weighing before application of the preparation and on the 7th day of the experiment with subsequent calculation of average daily live weight gain.

The economic efficiency of veterinary measures was determined according to the 'Methodology for determining the economic efficiency of veterinary measures' (Moscow, 1997).

The following were determined:

- total (actual);
- prevented economic damage;
- veterinary costs;
- economic effect obtained as a result of treatment measures;
- economic effect of treatment measures per 1 ruble of costs.

Statistical processing of experimental data was carried out using the statistical analysis package for Microsoft Excel®.

Clinical examination of piglets with gastroenteritis revealed general oppression, subfebrile body temperature $39,2 \pm 0,04^{\circ}\text{C}$ - $39,3 \pm 0,05^{\circ}\text{C}$, increased respiration to $38,9 \pm 0,05$ - $39,3 \pm 0,07$ respiratory movements/min and pulse to $105,0 \pm 1,85$ - $108,0 \pm 3,8$ beats/min (Table 2). In addition,

periodic liquefaction of faeces was registered, which acquired yellow-grey colour, without blood admixture, watery consistency, often with caustic gas bubbles.

Table 2 Dynamics of clinical parameters in piglets ($M \pm m$)

Animal group	Study days			
	1	3	5	7
	Temperature, ° C (physiological norm 38,0-39,0 ° C)			
1	39,3±0,03	39,2±0,1*	39,0±0,2*	38,8±0,07*
2	39,2±0,04	38,7±0,05*	38,6±0,06	38,5±0,03*
3	39,3±0,05	39,0±0,08	38,8±0,03*	38,6±0,04*
	Heart rate, beats/min (physiological norm 70-90 beats/min)			
1	106,0±2,65	106,0±2,8*	104,0±1,3*	89,4±1,9*
2	105,0±1,85	92,3±2,5*	88,3±1,8*	86,0±2,4*
3	108,0±3,8	94,0±1,5*	90,5±1,6*	87,0±2,8*
	Respiration, respiratory movements/min (physiological norm 20-30 d.d./min)			
1	39,3±0,07	39,2±0,02*	35,8±0,1	30,3±0,02
2	38,9±0,05	36,3±0,02	30,3±0,02*	28,2±0,04*
3	39,1±0,09	38,6±0,07*	34,2±0,04*	29,3±0,03*
	Oppression			
1	+	+	+	+
2	+	-	-	-
3	+	+	-	-
	Diarrhoea			
1	+	+	+	+
2	+	+	-	-
3	+	+	+	-

Note: hereinafter * - $p < 0.05$ in relation to the background; «+» - the sign is clearly expressed; «±» - the sign is weakly expressed; «-» - the sign is absent

The study of body temperature dynamics in experimental animals allowed to establish that the body temperature before treatment in control and experimental groups was at the upper limits of physiological norm and averaged $39,3 \pm 0,03^{\circ}\text{C}$, $39,2 \pm 0,04^{\circ}\text{C}$ and $39,3 \pm 0,05^{\circ}\text{C}$, respectively. Application of complex method of treatment positively influenced on normalisation of this index of clinical status. Thus, in the second and third experimental groups, compared to the control group, the body temperature of piglets decreased by $0,5^{\circ}\text{C}$ and $0,2^{\circ}\text{C}$ on the 3rd day, by $0,4^{\circ}\text{C}$ and $0,2^{\circ}\text{C}$ on the 5th day, and by $0,3^{\circ}\text{C}$ and $0,2^{\circ}\text{C}$ on the 7th day.

Measurement of heart rate in piglets on the background of treatment showed that before the beginning of treatment in piglets with gastroenteritis heart rate exceeded the upper limits of physiological norm. During the application of antibiotics and stimulant in the second and third experimental groups on the third day there was a decrease in heart rate by 13,7 beats/min and 12,0 beats/min compared to the control group; on the 5th day - by 15,7 beats/min and 13,5 beats/min; on the 7th day - by 3,4 beats/min and 2,4 beats/min.

Clinical studies of respiratory rate indicated that before treatment in sick suckling piglets it averaged $38,9 \pm 0,05$ – $39,3 \pm 0,07$ respiratory movements/min, which exceeded the upper limits of physiological norm. The conducted treatment of non-specific gastroenteritis allowed to reduce the studied index in comparison with the control group, respectively, on the 3rd day - by 2,88 respiratory movements /min and by 0,6 respiratory movements /min; on the 5th day - by 5,3 respiratory movements /min and by 1,6 respiratory movements /min; on the 7th day - by 2,1 respiratory movements /min and by 1,0 respiratory movements /min.

In the control group of piglets using Butophosphan, improvement of the general condition of animals, weakening of diarrhoea and signs of intoxication occurred only by the 7th day from the beginning of treatment.

The general condition of piglets with gastroenteritis improved with the use of antibiotic Amoxilong™ 150 LA and stimulant Butophosphan from the third day of its administration. Signs of central nervous system oppression disappeared - piglets had increased reaction to external stimuli, increased motor activity, increased appetite. On the second - third day of the disease, the frequency of defecation significantly decreased, the character of faeces changed - from liquid watery they became liquid lumpy, gradually thickened and shaped, becoming yellowish-brown in colour. Diarrhoea disappeared by the fifth day from the beginning of treatment.

During clinical observation of piglets, which were treated with antibiotic Ditrin and stimulant Butophosphan, improvement of general condition of patients and disappearance of main clinical signs of gastroenteritis were noted on the fifth day after the drug application, recovery of animals - on the 6th-7th day.

The data of morphobiochemical study of blood of piglets with gastroenteritis and according to the results of treatment are presented in Table 3.

Table 3 Morphobiochemical parameters of piglet blood ($M \pm m$)

Animal group	Study days			Physiological norm
	1	3	7	
	Erythrocytes, $\times 10^{12}/l$			
1	$3,9 \pm 0,52$	$4,2 \pm 0,39^*$	$4,4 \pm 0,23$	$4,1-5,6 \times 10^{12}/l$
2	$3,75 \pm 0,36$	$4,4 \pm 0,24^*$	$4,8 \pm 0,34^*$	
3	$3,6 \pm 0,45$	$4,4 \pm 0,12$	$4,6 \pm 0,26^*$	
	Leucocytes $\times 10^9/l$			
1	$13,5 \pm 0,65$	$13,0 \pm 2,8^*$	$12,8 \pm 1,3^*$	$10-12 \times 10^9/l$
2	$13,6 \pm 0,85$	$11,8 \pm 0,5^*$	$11,2 \pm 0,8^*$	
3	$13,4 \pm 0,8$	$12,8 \pm 1,5^*$	$12,0 \pm 0,6^*$	
	Haemoglobin, g/l			
1	$79,0 \pm 2,7$	$89,2 \pm 3,2^*$	$100,2 \pm 2,1$	$80-110 \text{ г/л}$
2	$78,0 \pm 1,5$	$93,3 \pm 2,2^*$	$107,0 \pm 1,2^*$	
3	$77,3 \pm 1,9$	$89,6 \pm 1,7^*$	$107,4 \pm 3,4^*$	
	Total protein, g/l			
1	$56,8 \pm 0,75$	$61,2 \pm 0,3^*$	$68,3 \pm 0,22^*$	$70-90 \text{ г/л}$
2	$58,2 \pm 0,81$	$68,9 \pm 0,74^*$	$75,9 \pm 0,32^*$	
3	$57,4 \pm 0,83$	$64,5 \pm 0,81^*$	$71,2 \pm 0,56^*$	
	Globulins, g/l			
1	$53,8 \pm 0,5$	$51,2 \pm 0,2^*$	$48,3 \pm 0,32^*$	$35-45 \text{ г/л}$
2	$52,2 \pm 0,51$	$48,4 \pm 0,4^*$	$39,9 \pm 0,2^*$	
3	$54,4 \pm 0,63$	$52,3 \pm 0,8^*$	$46,2 \pm 0,34$	

Haematological and biochemical parameters at the beginning of the experiment at intergroup comparison in all sick piglets had no reliable differences.

Haematological studies showed that the number of erythrocytes in sick piglets with gastroenteritis was at the level of $3,6 \pm 0,45 \times 10^{12}/l$ – $3,9 \pm 0,52 \times 10^{12}/l$, which is below the normative values. But during the observation this index gradually reached the physiological norm. As the suckling piglets recovered, this index was restored. By the 3rd day of the study the number of erythrocytes in animals of the second and third experimental groups increased by $0,3 \times 10^{12}/l$ and $0,6 \times 10^{12}/l$, and by the 7th day - by $1,05 \times 10^{12}/l$ and by $1,0 \times 10^{12}/l$ in comparison with the initial index.

In the control group the number of erythrocytes increased by $0,3 \times 10^{12}/l$ and by $0,5 \times 10^{12}/l$ by the 3rd and 7th day of the study.

A similar trend was registered when studying the dynamics of haemoglobin in the blood of piglets of control and experimental groups. The background index of haemoglobin in piglets with gastroenteritis was at the level of $77,3 \pm 1,9$ g/l - $79,0 \pm 2,7$ g/l. In the control group of piglets on the 3rd day of research the amount of haemoglobin in the blood increased by 1,2 g/l compared to the phono values; on the 7th day of research - by 21,2 g/l. In piglets of the second and third experimental groups the amount of haemoglobin in blood was higher than background values on the 3rd day of the experiment - by 15,3 g/l and by 12,3 g/l, respectively; on the 7th day of the experiment - by 29,0 g/l and by 30,1 g/l, respectively.

The number of leukocytes in the diseased piglets was at the level of $13,4 \pm 0,8 \times 10^9/l$ - $13,6 \pm 0,85 \times 10^9/l$, which is higher than the normative values, but the application of complex treatment allowed to normalise the number of leukocytes to the level typical for piglets of this age. Thus, in the second and third experimental groups a significant decrease in leucocytes was observed already on the 3rd day from the beginning of treatment and was lower than background values by $1,8 \times 10^9/l$ and $0,6 \times 10^9/l$, respectively. On the 7th day from the beginning of treatment the number of leukocytes stabilised within the physiological norm. However, in piglets of the control group, the number of leukocytes was higher than physiological values in all periods of the study.

It was found that gastroenteritis of piglets was accompanied by a decrease in total protein in the blood of piglets of control and experimental groups. The background value of total protein in sick piglets was $56,8 \pm 0,75$ g/l and $58,2 \pm 0,81$ g/l. On the 3rd day of the study the total protein exceeded the background values in the control, second and third experimental groups by 4,4 g/l, 10,2 g/l and 7,1 g/l, respectively; on the 7th day of the study by 11,5 g/l, 17,7 g/l and 13,8 g/l, respectively.

The content of globulins in the blood serum of piglets with gastroenteritis, on the contrary, was increased and registered at the level of $52,2 \pm 0,51$ g/l - $54,4 \pm 0,63$ g/l. During the conducted therapeutic measures the amount of globulins decreased in comparison with the background level in control, second and third experimental groups on the 3rd day of research by 2,6 g/l, by 3,8 g/l and by 2,1 g/l, respectively; on the 7th day of research - by 5,5 g/l, by 12,3 g/l and by 8,2 g/l, respectively.

Recovery of piglets was determined by the following signs: animals became active; appetite returned; temperature, pulse, respiration - within normal limits; skin mucous membranes - pink; skin turgor - preserved; faeces became clear, not liquid, natural odour (Table 4).

In piglets of the control group diarrhoea lasted $7,4 \pm 0,2$ days; in piglets of the second group – $4,2 \pm 0,3$ (3,2 days earlier than in the control group); in piglets of the third group – $5,5 \pm 0,23$ (1.9 days earlier than in the control group).

In addition, in the control and third experimental groups one and two calves fell down, respectively, while in the second group no deaths were registered (100% safety).

The average daily body weight gain of piglets was maximum in the second group and it was $231,8 \pm 4,4$ g.

Table 4 *Therapeutic efficacy of complex treatment for gastroenteritis in piglets*

Animal group (n=5)	Indicators					
	treatment duration, days	recovered, heads	safety, % (head count)	live weight at the beginning of the experiment, kg	live weight at the end of the experiment, kg	average daily gain, g
1 control	7,4±0,2	2	60 (2)	1,22±0,12	2,48±0,15	180,0 ± 6,3
2	4,2±0,3	3	100 (0)	1,18±0,15	2,8±0,21	231,8 ± 4,4
3	5,5±0,23	5	80 (1)	1,21±0,18	2,6±0,24	198,3 ± 6,2

To assess the economic efficiency of therapeutic measures implemented in piglet gastroenteritis, a system of indicators was used:

1. total (actual) damage;
2. prevented economic damage;
3. veterinary costs;
4. economic effect obtained as a result of treatment measures;
5. economic effect of treatment measures per 1 ruble of costs.

Table 5 shows that the greatest total economic damage was observed in piglets of the control and third groups, which included damage from animal mortality and damage from reduced live weight gain. In the second group it was formed only due to the reduction in live weight gain of piglets.

The greatest prevented economic damage was obtained as a result of therapeutic measures implemented through the application of complex treatment with the use of antibiotic Amoxilong™ 150 LA and stimulator of metabolism Butofan (2015,4 roubles).

Thus, the economic efficiency of antibiotic Amoxilong™ 150 LA and metabolism stimulator Butofan was maximised.

Table 5 *Cost effectiveness of complex therapy for gastroenteritis of piglets*

Animal group	Indicators of economic efficiency				
	Total economic damage (roubles)	Veterinary costs, (roubles)	Avoided economic damage (roubles)	Economic effect (roubles)	Economic effect per ruble of costs (roubles)
1 Control	926	688,25	1169,2	480,95	0,7
2	79,8	690,15	2015,4	1325,25	1,9
3	530	695,25	1565,2	869,25	1,2

The payback per ruble of invested costs in the groups receiving complex therapy was 1,9 roubles and 1,2 roubles in the second and third groups, respectively.

Thus, the following conclusions can be drawn:

1. It has been established that piglets with nonspecific gastroenteritis have oppression, subfebrile body temperature 39,2±0,04°C - 39,3±0,05°C, respiratory rate up to 38,9±0,05 -

39,3±0,07 respiratory movements/minute, and pulse up to 105,0±1,05 – 105,0±1,07 respiratory movements/minute. and pulse up to 105,0±1,85 – 108,0±3,8 beats/min; periodic liquefaction of faeces, which acquired yellow-grey colour, without blood, watery consistency, often with gas bubbles.

The number of erythrocytes, in piglets diseased with gastroenteritis, was at the level of $3,6 \pm 0,45 \times 10^{12}/l$ - $3,9 \pm 0,52 \times 10^{12}/l$, which is below the normative values. In addition, non-specific gastroenteritis of piglets was accompanied by a decrease in total protein ($56,8 \pm 0,75$ g/l - $58,2 \pm 0,81$ g/l), haemoglobin ($77,3 \pm 1,9$ g/l - $79,0 \pm 2,7$ g/l) in the blood of piglets of control and experimental groups. On the contrary, the content of globulins in the blood of piglets ($52,2 \pm 0,51$ g/l - $54,4 \pm 0,63$ g/l) and the number of leucocytes in the blood ($13,4 \pm 0,8 \times 10^9/l$ - $13,6 \pm 0,85 \times 10^9/l$) was increased.

Application of complex method of treatment with antibiotic Amoxilong™ 150 LA and metabolism stimulator Butofan promotes normalisation of haematological and biochemical blood parameters within physiological level by the 3rd day from the beginning of treatment, whereas the use of antibiotic Ditrim and metabolism stimulator Butofan, as well as monotherapy with metabolism stimulator Butofan, only by the 7th day from the beginning of treatment.

2. As a result of the research it was found that in piglets of the control group, when using Butofan metabolism stimulator, the duration of the disease was $7,4 \pm 0,2$ days, average daily live weight gain was $180,0 \pm 6,3$ g, safety was 60%.

In piglets of the second group, when complex treatment with antibiotic Amoxilong™ 150 LA and metabolism stimulant Butofan was applied, the duration of the disease was $4,2 \pm 0,3$ days, average daily live weight gain was $231,8 \pm 4,4$ g, safety was 100%.

In piglets of the third group, at application of complex treatment with antibiotic Ditrim and metabolism stimulator Butofan, duration of the disease was $5,5 \pm 0,23$ days, average daily live weight gain - $198,3 \pm 6,2$ g, safety was 80%.

3. Economic efficiency of veterinary measures per one ruble of expenses during complex treatment of nonspecific gastroenteritis of piglets was 0,7 roubles, 1,9 roubles and 1,2 roubles, respectively.

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