Analyzing the obtained set of digital characteristics of dysbiosis and the severity of its clinical signs, we believe that at the beginning of these diseases intestinal dysbiosis has 3 (severe) degree of severity.

A day later, in groups of calves with abdominal enteritis, intergroup differences in the dynamics of representatives of intestinal symbiosis were noted. Thus, in the first group, already at this stage, an intensive significant ($p \leq 0.05$) growth of bifido- and lactoflora was observed on average 35%, in the second to 8.64 and 8.15 lg CFU/g (vs. 10.12 and 9.32 lg CFU/g in the control), which was an intergroup difference of 19%.

Regarding the conditional pathogens and pathogenic strains, a significant ($p \leq 0.05$) decrease in both groups was found, determined, apparently, by the different sensitivity of microorganisms to antimicrobial agents. Thus, the intensive proliferation of the indigens in the first group in the intergroup comparison, even with similar dynamics of some conditioned pathogens, allows us to state a different degree of changes in the experimental groups. Following this logic, in the first group we classified 1 (light), and in the second group – 2 (medium) degree of dysbiosis.

By the fifth day of the experiment, the majority of calves from the first group, who had abdominal enteritis and dyspepsia, had no clinical signs of digestive disorders. The results of the study of feces of young animals with abdomazoenteritis show a significant ($p \leq 0.05$) numerical prevalence of bifido- and lactobacilli in calves of the first group, both in comparison with the control and with the second group by 1-2 orders of the logarithm. A statistically insignificant intergroup difference in the level of anaerobic bacilli was established, and by the number of streptococci it was 1 order of the decimal logarithm, with prevalence in the calves of the second group. Based on the analysis of the results obtained, in the calves of the second group, taking into account the classification criteria of dysbiosis, at the time of the study, 1 degree of dysbiosis was found, similar in description to that of the first group.

On day 7, the calves of the second group had no clinical signs of disease, the values of the studied parameters were balanced in the 7-10% range of insignificant difference with the corresponding controls ($p \geq 0,05$), pathogenic strains of microorganisms were not revealed. It should be noted that we have established a similar dynamic of intestinal microbiota in calves with dyspepsia. The difference was that the degree of homeostasis of the indices was less intense than in young animals with a diagnosis of abomasoenteritis.

The presented classification was based on the results of our experiments, during which 3 degrees of dysbiosis were diagnosed. According to the medical literature, intensive proliferation of conditioned pathogens against the background of a decrease in colonization resistance of the colon can lead to the translocation of opportunistic microflora from the intestinal biotope into the internal environment of the organism, which is classified as the 4th degree of dysbiosis by the authors of scientific works. In the course of our research, similar results were not obtained. However, exclude such a trend is impossible and this issue requires additional research.

Thus, on the basis of the analogies performed for different nosological units having a single profile orientation, it is possible to characterize dysbiosis in the staging of its development, classifying it into 3 degrees of severity. The degree of manifestation of changes in the quantitative and qualitative composition of the intestinal microbiota, apparently, determines the pathogenetic difference in the course and duration of the diseases under discussion in the experimental groups.

Key words: dysbiosis, classification, cattle, abomasoenteritis, dispepsia

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CORRECTION OF ANEMIA SYNDROME IN SPORT HORSES

У статті представлені принципи корекції анемічного синдрому в спортивних коней. Проведено аналіз результатів дослідження гематологічних показників в спортивних коней. Показано, що у коней після фізичного навантаження розвивається анемія гемолітичного ґенезу,оскільки в крові зростає концентрація загального білірубіну та вміст феруму.

Застосування спортивним коням під час фізичного навантаження препаратів метаболічної дії (Роборанте Калієр та Ронколейкін) сприяє відновленню показників еритроцитопоезу (збільшеннч кількості еритроцитів, вмісту гемоглобіну, величини гематокриту), нормалізує постачання тканин оксисеном та усуває наслідки гіпоксії.

Ключові слова: анемічний синдром, роборанте калієр, ронколейкін, спортивні коні.

Carrying out a single screening of blood indices is used to compare the results with physiological norms, and the benefit of regular laboratory blood tests allows us to assess the response of horses to physical activity and training [1].

In horses, physical activity is accompanied by changes in hematological indices due to the development of hypoxia, is an answer to the provision of tissues with oxygen, and is aimed at maintaining homeostasis of the organism [2, 3].

Changing hematological parameters for anemic syndrome may occur with insufficient assimilation of ferrum, vitamin B12, folic acid in diseases of the gastrointestinal tract, during pregnancy and lactation [4], as well as in difficult physical work [5].

The main method of diagnosis of anemia is general blood test [6], and the obtained results may be useful fo clinicians who, under practical conditions, encounter the problem of diagnosis of the disease in animals [7].

There is a known pathophysiological condition in sports medicine called "athletic anemia", which is characterized by low hemoglobin, hematocrit and the number of red blood cells [8, 9, 10]. The etiology of this condition is multifactorial, and one of the reasons may be an increase in blood volume that occurs immediately after training [11], or a long period of training that is set up in athletes [12]. The pathological condition, called "athletic anemia," is associated with episodes of intravascular hemolysis caused by physical activity [13, 14, 15]. After physical activity, anemia of hemolytic origin was also recorded in sport horses [16]. During the maximum physical activity, hemoglobin was detected in the urine of horses [17, 18].

In horses for physical load, there is a need for more maintenance of organs and tissues with energy and oxygen, and the ability of animals to load is limited by the efficiency of supply of oxygen to working muscles [19].

The purpose of the work was to determine the effectiveness of the use of metabolic therapy for the correction of anemia syndrome in sports horses.

Material and methods. Sport horses, in the classical forms of equestrian sport of the Ukrainian warmblood (n = 20), Hanoverian (n = 15) and Westphalian (n = 15) breeds were included in the study. The average age of horses was 8.4 ± 0.71 g. (3.5-16.0 g.), weight – 479.4 ± 8.54 kg (350-605 kg).

The horses were examined clinically and their hematological parameters were analyzed. The effectiveness of metabolic therapy, which included the injection to Roborante Calier 20.0 ml subcutaneously for 6 days and Roncoleukinum – injected 3 times 500,000 IU subcutaneously at 48 hours intervals was studied 10 days after the treatment.

The research was conducted in the middle of the season of intensive use of sport horses during internal competitions. The daily training corresponded to the curriculum according to the use of animals in the sport. During treatment, the horses were subjected to physical activity of medium intensity for of 1 hour: walk – 5 minutes; rising trot – 10 minutes; walk – 5 minutes; sitting trot – 10 min; walk – 10 minutes; gallop with transition to a walk – 10 min; walk – 10 min.

Animals are kept in individual boxes, feeding is carried out three times a day by traditional food: oats, herbs, herbs from different grass, carrots, with taking into account individual needs. The ration of sport horses was additionally supplemented with mineral-vitamin mixtures. The composition of the ration provided a daily need for energy, protein, minerals and vitamins, in accordance with the standards for sports horses feeding [20]. The animals had unlimited access to water.

Blood for research was taken after a maximum load at a distance of 1600 m.

The overall blood test was examined on an automatic hematologic analyzer Mythic 18 (Orphee S.A., Switzerland) using PZ Cormay S.A. reagents. (Poland).

Blood count was based on the number of red blood cells (RBC), hemoglobin content (Hb), hematocrit (PCV), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular *hemoglobin concentration* (MCHC), *red blood cell distribution width* (RDW), width of distribution of red blood cells in volume (RDW-SD), number of leukocytes (WBC) and thrombocyte (PLT), thrombocrite (PCT), mean platelet volume (MPV), platelet *distribution width* (PDV).

In the blood serum of horses, the content of the ferrum and the concentration of total bilirubin were determined using an automatic biochemical analyzer Mindray BS-120 (China) using PZ Cormay S.A. reagents (Poland).

The mathematical processing of the results was carried out using the *Microsoft Office Excel* software with the help of generally accepted methods of variation statistics with an estimation of the average (M), its errors (m), probability was established according to Student's t-criterion.

Results and discussion. The research revealed that in sport horses with metabolic disorders, anemic syndrome appeared after physical activity [5]. In clinically healthy animals after physical activity the number of erythrocytes ($p < 0.01$-0.001), the hemoglobin content ($p < 0.05$-0.001) and the hematocrit value ($p < 0.01$-0.001) is increased in blood, which ensures the transport of oxygen due to the high de-

mand for it in tissues. In horses with metabolic disorders, the number of erythrocytes, hemoglobin content and hematocrit value after physical activity have a tendency to increase, which is the result of the development of anemic syndrome in animals [5].

In blood serum of horses after physical activity, the concentration of total bilirubin is also increased: in the horses of Ukrainian warmblood by 22%, in the Hanoverian – by 3.5% in comparison with the indicators before load, and by 22.2% ($p < 0.05$) in the Westphalian breeds horses [21]. In sport horses of the Ukrainian warmblood breed for anemic syndrome, the total bilirubin was significantly higher (63.5%; $p < 0.01$) in comparison with the indicator for loading and compared with clinically healthy animals (34.0%; $p < 0.05$). In the horses of the Hanoverian and Westphalian breeds for anemic syndrome, the total bilirubin was significantly higher (39.1%, $p < 0.01$ and 59.8%, $p < 0.001$) in comparison with the index before load and compared with clinically healthy animals (34.4 %, $p < 0.01$ and 30.8%, $p < 0.01$), respectively.

The content of total bilirubin in sport horses the next day after exercise was elevated [22, 23, 24].

It was found out, that athletes, after an intensive training program, tend to have a deficiency of ferrum, which may lead to the development of anemia [10, 25]. There is an assumption that the present pathogenesis mechanism is associated with the accumulation of ferrum in the liver, which during long training periods limits the use of the element from the bone marrow and reduces its availability for hemopoiesis [13].

The decrease in the concentration of ferrum in the blood of horses [26] is associated with a permanent loss and decrease in the absorption of the element in the gastrointestinal tract [27]. Compared to the animals used in recreation, the content of the ferrum in sport horses was higher than the control values (13.0-25.0 μmol/l) [28] and associated with the intensification of erythropoiesis, which is reflected in high values of erythrocytes, hemoglobin and hematocrit. However, other authors [29, 30] showed high levels of ferrum in healthy adult horses (29.33 μmol/l), while [31] found significantly lower rates (12.03-18.29 μmol/l).

Our research have shown that the concentration of ferrum in blood serum of sports horses before and after exercise was elevated (Fig. 1).

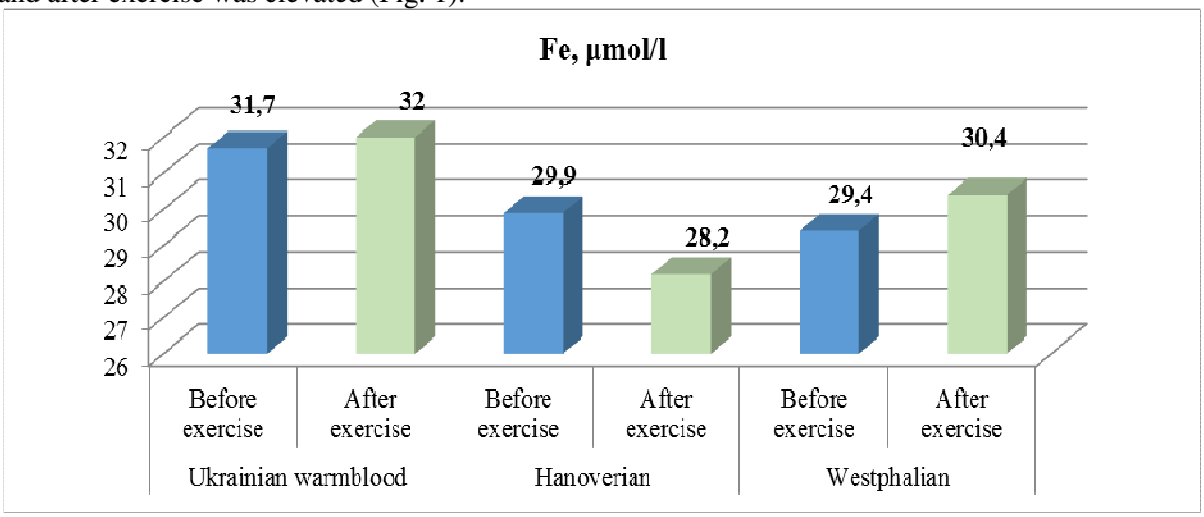

Fig. 1. **The content of ferrum in blood serum of sports horses before and after physical activity.**

Our results are consistent with the literature data, which showed an increase in the content of the ferrum was registered in athletes [32, 33] and sport horses [34, 35]. This may be due to hemoconcentration caused by physical load. But, other authors have shown [36] that the athlete's concentration of ferrum in serum increases 30 minutes after the load, and, consequently, it is not related to haemoconcentration. It is obvious that the ferrum content in serum is associated with hemolysis of erythrocytes, caused by exercise in horses [37].

The analysis of the results showed that the use of Roborante Kalier and Roncoleukinum in the treatment of sport horse contributed to a possible increase in the number of red blood cells in the blood: in the animals of Ukrainian warmblood (7.8%; $p < 0.05$), Hanoverian (10.2%; $p < 0.05$) and Westphalian (11.1%; $p < 0.05$; Table 1) breeds. In the blood of horses, a probable increase in the con-

centration of hemoglobin was detected by 7.4% (p <0.05), 9.6% (p <0.05) and 7.8% (p <0.05), respectively, compared to the period before treatment (Table 1).

In sport horses an increase of hematocrit is observed: Ukrainian warmblood (7.8%; p <0.05), Hanoverian (9.4%; p <0.05) and Westphalian (7.6%; p <0.05; Table 1) breeds.

Table 1 – **Morphological indices of blood of sports horses for anemic syndrome and after treatment**

Breeds of horses	Treatment period	RBC, 10^{12}/L	Hb, g/l	HCT, %	MCV, fl	MCH, pg	MCHC, g/dl	RDW, %	RDW-SD, fl
Ukrainian warmblood	Before	6.6–9.5 7.7±0.20	108.0–158.0 128.8±3.29	29.1–42.0 34.4±0.94	37.9–47.9 44.5±0.69	14.3–18.0 16.5±0.25	35.0–42.9 37.5±0.68	15.3–21.4 19.1±0.44	28.4–34.9 32.3±0.50
	After	7.0–10.4 8.3±0.21*	112.,0–165.0 138.3±3.21*	30.9–44.1 37.1±0.86*	37.3–47.1 44.0±0.64	14.5–19.0 16.6±0.27	36.0–42.1 37.5±0.57	15.1–21.7 19.4±0.47	28.3–35.1 32.6±0.52
Hanoverian	Before	6.8–9.4 7.8±0.25	98.0–166.0 127.4±3.98	26.7–39.2 33.0±0.98	36.8–47.0 42.6±0.88	14.5–18.9 16.5±0.45	36.3–46.2 38.7±0.63	18.2–21.8 20.5±0.27	27.9–35.8 31.6±0.77
	After	7.1–10.6 8.6±0.28*	109.0–176.0 139.6±4.21*	28.7–43.0 36.1±1.12*	37.0–46.5 42.5±0.79	14.3–18.6 16.4±0.40	36.1–46.0 38.5±0.57	18.0–21.9 20.6±0.31	27.8–36.0 31.0±0.71
Westphalian	Before	6.0–8.5 7.2±0.25	114.0–136.0 128.0±2.19	30.1–39.8 33.0±0.75	41.7–47.9 46.1±0.80	16.4–19.7 17.8±0.57	36.3–41.8 38.8±0.67	18.4–21.3 19.4±0.31	32.3–35.0 33.9±0.53
	After	7.0–9.1 8.0±0.24*	112.0–169.0 138.0±3.47*	31.0–41.5 35.5±0.72*	42.0–48.1 46.4±0.70	16.4–18.8 17.9±0.40	36.0–41.4 38.7±0.63	18.6–21.2 19.5±0.27	31.3–35.5 34.0±0.55

* – p< 0,05 compared with the rates before treatment.

Indices of red blood, including the mean corpuscular volume (MCV), the mean corpuscular hemoglobin (MCH) and the mean corpuscular ***hemoglobin concentration*** (MCHC), the ***red blood cell distribution width*** (RDW) and the width of distribution of red blood cells in volume (RDW-SD) in sport horses of Ukrainian warmblood, Hanoverian and Westphalian breeds before and after treatment were almost similsr and did not differ statistically (Table 1).

In sport horses after the treatment there is a tendency to increase the number of leukocytes: in Ukrainian warmblood breed by 1.3%, in the Hanoverian and Westfalian breeds by 7.0% and 2.8%, respectively (Table 2).

Table 2 – **Number of leukocytes and indicators of thrombopoiesis in sport horses for anemic syndrome and after treatment**

Breeds of horses	Treatment period	WBC, 10^9/L	PLT, 10^9/L	PCT, %	MPV, fl	PDV, %
Ukrainian warmblood	Before	4.9–10.1 7.8±0.37	37.0–169.0 104.2±10.92	0.021–0.107 0.059±0.0058	5.1–7.5 5.7±0.16	68.3–91.5 80.1±1.90
	After	4.8–10.4 7.9±0.40	54.0–176.0 107.5±10.75	0.027–0.120 0.061±0.0060	5.1–7.6 5.9±0.17	69.5–93.4 82.,6±1.96
Hanoverian	Before	5.4–8.3 7.1±0.23	73.0–180.0 113.1±9.80	0.039–0.114 0.063±0.0043	4.9–7.0 5.1±0.13	68.5–93.1 82.5±1.84
	After	5.4–8.6 7.6±0.27	72.0–193.0 119.7±10.37	0.032–0.119 0.067±0.0045	4.9–7.7 5.2±0.16	68.0–95.3 81.7±1.92
Westphalian	Before	5.1–9.5 7.1±0.49	65.0–178.0 106.4±11.23	0.033–0.101 0.060±0.0056	5.0–6.5 5.5±0.10	74.0–98.3 80.2±2.12
	After	5.2–10.0 7.3±0.47	68.0–181.0 111.7±10.57	0.035–0.100 0.063±0.0054	4.9–6.2 5.4±0.11	73.7–94.1 79.6±2.03

The treatment did not have a negative effect on the indicators of thrombopoiesis in sport horses of all experimental groups (Table 2).

It should be stated that suggested treatment had a positive effect on hemopoiesis, as the number of red blood cells, hemoglobin content and hematocrit value significantly increased. These changes can be explained by the greater biological availability of drugs used for treatment.

Conclusion. 1. Anemia, that develops in sport horses during load is obviously of hemolytic genesis, since the concentration of total bilirubin and the content of the ferrum increases in blood.

2. The use of preparation with metabolic action in sport horses during physical activity of (Roborante Kalier and Roncoleukinum) contributes to the restoration of the indices of erythrocytosis (increase in the number of erythrocytes, hemoglobin content, hematocrit values), normalizes the supply of tissues with oxygen and eliminates the effects of hypoxia.

Perspectives for further research. To study the effectiveness of metabolic therapy for the treatment and prevention of myocardial dystrophy in sport horses.

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Коррекция анемического синдрома в спортивных лошадей

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В статье представлены принципы коррекции анемического синдрома в спортивных лошадей. Проведен анализ результатов исследования гематологических показателей в спортивных лошадей. Показано, что у лошадей после физической нагрузки развивается анемия гемолитического генеза, поскольку в крови возрастает концентрация общего билирубина и содержание фе-рума. Применение спортивным лошадям во время физической нагрузки препаратов метаболического действия (Роборанте Калиер и Ронколейкин) способствует восстановлению показателей эритроцитопоезу (збильшеннч количества эритроцитов, содержания гемоглобина, величины гематокрита), нормализует снабжение тканей оксисеном и устраняет последствия гипоксии.

Ключевые слова: тощий синдром, роборанте калиер, ронколейкин, спортивные лошади.

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А-, Е-ВІТАМІННИЙ ТА КАЛЬЦІЄ-ФОСФОРНИЙ ОБМІН У КУРЧАТ-БРОЙЛЕРІВ ЗА ВИКОРИСТАННЯ ПРЕПАРАТУ АБЕТКА ДЛЯ ТВАРИН

У статті наведені результати клініко-біохімічних досліджень з науково-виробничої апробації вітамінно-амінокислотного комплексу «Абетка для тварин». За клінічного дослідження птиці встановлено, що у курчат-бройлерів дослідної групи, якій випоювали препарат у дозі 1 мл/л води на початку роботи ознаки, кон’юнктивіту відмічали у 3,4, перозу – у 3,1 % поголів’я. По завершенню експерименту у птиці групи досліду курчата з ознаками кон’юнктивіту складали – 1,7 % (24 особини) та перозу – 1,3 % (9 голів). Тобто препарат у зазначені дозі спричинив зменшення відсотку птиці з клінічними ознаками кон’юнктивіту та перозу. Вміст вітаміну А по завершенню досліду (друге випоювання препарату) був більшим за нижню межу норми у 50 % птиці дослідної групи і в середньому становив – 183,9±6,51 мкг/100 мл, проти 159,6±4,81 мкг/100 мл у птиці групи контролю. За дослідження мінерального обміну встановлено, що після дворазового застосування препарату 90 % птиці вміст кальцію був вищим за нижню межу норми. Тобто за третього відбору крові концентрація цього макроелемента у курчат контрольної групи складала 2,35±0,06 ммоль/л, а в дослідній групі, вона вірогідно ($p<0,05$) збільшувалася до 2,54±0,04 ммоль/л. Різниця між вмістом загального кальцію у птиці третього і першого відбору дослідної групи склала 13 % ($p<0,001$).

Ключові слова: курчата-бройлери, вітамінно-амінокислотний комплекс «Абетка для тварин», вітамін А, вітамін Е, загальний кальцій, неорганічний фосфор, магній.