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Microecological Approaches to the Prophylactic Correction of Dysbacteriosis Microbiota in the Gastrointestinal Tract of Ducks

Nadezhda Lescheva
Department of Veterinary Microbiology, Infectious and Invasive Diseases
Omsk State Agrarian University named after P.A. Stolypin
Omsk, Russia
na.lescheva@omgau.org

Valentina Pleshakova
Department of Veterinary Microbiology, Infectious and Invasive Diseases
Omsk State Agrarian University named after P.A. Stolypin
Omsk, Russia
vi.pleshakova@omgau.org

Natalya Zolotova
Department of Veterinary Microbiology, Infectious and Invasive Diseases
Omsk State Agrarian University named after P.A. Stolypin
Omsk, Russia
ns.zolotova @omgau.org

Tatyana Lorengel
Department of Veterinary Microbiology, Infectious and Invasive Diseases
Omsk State Agrarian University named after P.A. Stolypin
Omsk, Russia
ti.lorengel@omgau.org

***Abstract*— The article presents the results of the probiotic preparation "Olin" impact on the microbiocenosis of various biotopes in the avian gastrointestinal tract, immune response and productive indicators. Two groups of ducks were formed for the experiment, with 10 animals in each. Ducks of the 1st (experimental) group received the "Olin" probiotic from day 1 with the main diet until the end of feeding period. The 2nd (control) group received only the main diet. The conducted comprehensive studies allow us to conclude that by the age of 60 days (slaughter age of ducks) the dominant members of the microbiocenosis of the studied biotopes in the gastrointestinal tract in the experimental group (No. 1) using the probiotic were: *Enterococcus faecalis, Staphylococcus epidermidis, Escherichia coli, Bifididium bifididium* and *Lactobacillus spp*. There was a decrease in the population of beneficial microbiota in the control group, but increase of *Proteus vulgaris* and *Klebsiella pneumoniae*. Ducks of the 2nd group revealed a high persistent potential of opportunistic microorganisms. The highest level of anti-lysozyme activity (ALA) was found in *Enterobacter spp*. – 3.1 µg/ml, *Escherichia coli* – 2.21 µg/ml and *Proteus vulgaris* – 1.75 µg/ml. Bacteria isolated in ducks had a high degree of colonization ability. On average, the microorganism adhesion index (MAI) varies from 2.88 to 6.84 with a fairly high AAI (average adhesion indicator) – from 2.2 to 6.12. The vast majority of microorganisms were highly sensitive to enrofloxacin – 83.3%, tylosin – 66.6%, ciprofloxacin, chloramphenicol – 83.3%. The use of a probiotic preparation for the prevention of dysbiosis contributed to an increase in the content of lactobacilli and bifidobacteria and to a decrease in the number of opportunistic microorganisms in all sections of the gastrointestinal tract of ducks, as well as an increase in live weight and a decrease in feed conversion by 8%.**

Keywords—ducks, enterobiocenosis, dysbiosis, persistent properties, probiotic.

I. INTRODUCTION

The study of microbial endoecology of animals and, in particular, poultry can be attributed to the most relevant areas of basic and applied research in veterinary medicine. [1,2]

First of all, this is connected with microbiocenosis as a key role in the life of a macroorganism, and in particular with frequently observed changes in normal microbiome, which include an increasing number of opportunistic microorganisms and their associations that cause infectious pathologies. [1,3,4]

In this regard, the identification of the species composition and structure of the associates of the microbiome of the gastrointestinal tract of birds is of particular interest, which is characterized by the greatest diversity among other biotopes of the body. In addition, it was shown that there is not a single function of a macroorganism that was not directly or indirectly impacted by the microbiocenosis associates of this ecological niche.

It should be noted that despite a large number of studies on the microbiocenoses of the gastrointestinal tract of farm animals, few studies have been devoted to the qualitative and quantitative composition of the enterobiocenosis associations of poultry, and especially ducks. In addition, even taking into account the fact that modern and quite affordable, high-tech methods, comprehensive studies of the species structure of the symbiotic communities of microbiocenosis of various bird biotopes, and especially with dysbiosis, have not received proper attention in veterinary science. [5, 6] In this regard, considerong the fact that the pathology of the gastrointestinal tract in birds continues to occupy a leading place in the nosological structure of the main diseases, it becomes important to develop methods for early diagnosis and complex correction of enteromicrobiocenosis, aimed not only at restoring the evolutionary prevailing enteromicrobiome, but also providing preservation and improvement of productive qualities of poultry. It has been established that the economic damage caused by dysbiosis is very significant and consists of a decrease in weight gain, egg production, embryo mortality, duckling and adult bird mortality and the costs of measures to improve the economy. The main approach to treatment and prevention of diseases of the gastrointestinal tract in veterinary practice over the past five decades is antibiotic therapy. The spectrum of antibiotic use in agricultural production covers almost all sectors of livestock farming, including poultry farming. However, despite the successes achieved in poultry farming in the field of maintaining veterinary well-being, many unresolved issues remain, including those related to the treatment and prevention of digestive system pathology. First of all, this is due to the fact that the irrational and uncontrolled use of antibiotics has led

to the development of resistance of many microorganisms to this group of drugs. [7] In addition, unreasonably high doses of several antibiotics have a side effect on the macroorganism. In particular, the symbiotic equilibrium of the microbiome of the gastrointestinal tract changes in the negative direction, the number of obligate associations of the bacteriocenosis decreases and the level of opportunistic microbiota and multidrug resistance increases, highly virulent strains of previously unknown serotypes of pathogenic bacteria appear which leads to a significant decrease in the effectiveness of antibiotic therapy. [8] It is also important that the main pharmacological groups of the antibiotics used in humans and farm animals are the same, the residual amounts of antibacterial drugs in food products contribute to the emergence of resistant strains of microorganisms in humans.

One of the decisive points in the successful infections control is the right treatment regimen. Due to the wide spread of antibiotic-resistant strains of microorganisms, especially the family of enterobacteria, the effectiveness of many antibacterial drugs is sharply reduced. An alternative to antibiotic drugs in animal husbandry are probiotics – drugs that contain substances of microbial and non-microbial origin, which, when administered naturally, have a beneficial effect on the physiological functions and biochemical reactions of the host organism through optimization of its microbiological status. [9-13]

Probiotics, unlike antibiotics, do not adversely affect the normal microbiome, therefore they are widely used for the prevention and treatment of diseases of the gastrointestinal tract of birds. These biological products are characterized by a pronounced clinical effect in the treatment of some acute intestinal infections, including colibacteriosis. Probiotics are able to increase the anti-infective resistance of the body, cause an anti-allergenic effect in some cases, and regulate and stimulate digestion.

Based on the foregoing, the research objective is the correction of the microbiocenosis of various biotopes of the gastrointestinal tract of ducks with the probiotic preparation “Olin”.

II. Methods

The studies were carried out on the basis of the Omsk Regional Veterinary Laboratory in the department of avian diseases (consultant, head of the department, candidate of veterinary sciences – L.I. Cherkashin). The object of the study was the Peking ducks. Two groups of birds with 10 animals in each were formed for the experiment. The ducks of the 1st group received the “Olin” probiotic from day 1 with the main diet until the end of feeding period (60 days of age). The 2nd (control) group received only the main diet. Samples of the contents of various biotopes of the gastrointestinal tract of birds served as the starting material for bacteriological studies. For the isolation and cultivation of microorganisms, conventional methods were used. The following nutrient media were used: meat peptone agar, 5% blood agar with defibrinated horse blood, salt agar, Endo medium, lactobac-agar, pepted meat broth, Sabouraud agar. Cultural properties were determined visually, under a 4x magnifying glass and using a stereoscopic microscope MBS-10 (8x-16x). To determine the species composition of the isolated microorganisms, biochemical studies were performed using various media: Gissa’s glucose media with glucose, lactose, sucrose, mannitol and maltose; Endo agar; 3% hydrogen peroxide solution test; Simmons citrate agar, Olkenitzky agar (triple sugar agar with urea). Based on the morphological, cultural and biochemical properties of the microorganisms, their generic and species affiliation was determined using the “Bergey's Manual of Systematic Bacteriology” (1997) and the “Zoopathogenic Microorganism Detector” (M. Sidorov et al., 1995).

Sensitivity to antibacterial drugs (oxytetracycline, doxycycline, tylosin, enrofloxacin, ciprofloxacin, levomycethin, nystatin, ketoconazole) was determined by the disk diffusion test. Müller-Hinton agar was used to assess bacterial susceptibility. The inoculum was prepared using the direct suspension method in a sterile isotonic solution, and a pure 24-hour bacterial culture, grown on meat peptone agar, was used.

We studied persistent properties: anti-complementary (ACA) and anti-lysozyme (ALA) activities, as well as the adhesive properties of isolated enterobacteria.

Sheep red blood cells were used to evaluate the in vitro adhesive properties of microorganisms isolated from ducks.

The adhesive properties of microorganisms were evaluated by the following indicators: AAI (average adhesion indicator); C (coefficient of participation of red blood cells in the adhesive process); MAI (microorganism adhesion index), which was calculated by the formula (1):

$$\text{MAI} = \frac{AAI \times 100}{\text{C}} \quad (1)$$

AAI – was determined by counting the number of microorganisms attached to the red blood cell when counting per 100 red blood cells. C – by calculating the percentage of red blood cells with adherent microbes on their surface (determined visually, when counting per 100 red blood cells).

The microorganism was considered non-adhesive with MAI <1.75, low-adhesive – from 1.76 to 2.5, medium-adhesive – from 2.51 to 4.0 and highly adhesive – above 4.0.

Organoleptic studies of duck meat were carried out in accordance with GOST 51944-2002 “Poultry meat. Methods for the determination of organoleptic indicators, temperature and weight”. The total water conten in the ducks’ muscle tissue was determined according to the general method by drying the sample in an oven at 105 °C to the constant weight (GOST 9793-74 “Meat and meat products. Methods for determining water”). The amount of total protein – according to the Kjeldahl method (GOST 25011-81 “Meat and meat products. Methods for the determination of protein”). Mass fraction of fat – according to Soxhlet (GOST 23042-86 “Meat and meat products. Methods for the determination of fat”).

Statistical processing of the obtained data was carried out using the Microsoft Excel 2007 computer program. The reliability of the difference in the results of the experimental digital material was checked using the Student's t-test considering recommendations of G. F. Lakin (1990) and V. A. Seredin (2001).

III. RESULTS

As a result of bacteriological studies of various biotopes in the digestive tract of ducks in the control group, representatives of both obligate and transient microbiota were isolated (Table 1).

TABLE I. MICROBIOCENOSIS OF GASTROINTESTINAL TRACT OF DUCKS (60 DAYS OF AGE), LG CFU/G (N = 10, 2ND (CONTROL) GROUP)

	Oral cavity	Esophagus	Proventriculus	Gizzard	Small intestine	Large intestine	Ceca	Cloaca
Escherichia coli	6.8±0.03	6.4±0.12	-	-	5.9±0.12	8.4±0.19	6.6±0.18	7.6±0.12
Enterococcus faecalis	5.1±0.03	5.1±0.12	5.2±0.12	5.1±0.03	4.9±0.23	6.3±0.12	5.7±0.23	7.1±0.1
Enterococcus faecium	4.8±0.03	-	-	-	-	5.1±0.13	5.8±0.09	4.8±0.32
Staphylococcus epidermidis	7.8±0.32	4.8±0.35	3.8±0.31	4.3±0.2	5.7±0.34	4.9±0.26	5.6±0.15	5.1±0.2
Citrobacter diversus	7.6±0.12	-	2.6±0.24	-	3.9±0.24	4.6±0.26	4.6±0.29	4.9±0.06
Enterobacter spp	-	-	-	-	-	8.7±0.2	-	7.6±0.27
Candida albicans	5.1±0.09	5±0.15	-	-	-	-	5.5±0.18	6.6±0.15
Bifidobacterium spp.	11±0.07	10.8±0.31	10.1±0.38	-	10.1±0.13	10.3±0.15	10.8±0.21	10.1±0.13
Lactobacillus spp.	9.2±0.33	8.6±0.43	8.8±0.16	8.7±0.31	9.3±0.34	8.6±0.43	8.8±0.34	8.8±0.37
Proteus vulgaris	-	-	-	-	-	-	4.2±0.24	5.3±0.15
Klebsiella pneumoniae	-	-	-	-	-	-	-	5.5±0.26

«-» - no increasing

In ducks of 60 days of age, that consumed the "Olin" probiotic preparation daily with feed for the entire growing period, the oral microbiota was represented by the following composition: the number of Staphylococcus epidermidis and Citrobacter diversus was 1.1 times less than that of the ducks grown only on the main diet, and amounted to 7.1 ± 0.09 and 6.8 ± 0.03 (p <0.01) lg CFU/g, respectively (Table 2). It was found that the number of Escherichia coli decreased insignificantly by 3% (to 6.6 ± 0.06; p <0.05) and Enterococcus faecalis by 2% (to 5 ± 0.06); and also a 3% increase in the amount of Bifidobacterium spp. up to 11.3 ± 0.09 (p <0.05) and Lactobacillus spp. - by 2% (up to 9.4 ± 0.21) lg CFU / g.

TABLE II. MICROBIOCENOSIS OF GASTROINTESTINAL TRACT OF DUCKS THAT CONSUMED THE "OLIN" PROBIOTIC (60 DAYS OF AGE), LG CFU/G (N = 10, 1ST (EXPERIMENTAL) GROUP)

	Oral cavity	Esophagus	Proventriculus	Gizzard	Small intestine	Large intestine	Ceca	Cloaca
Escherichia coli	6.6±0.06*	5,4±0,03	-	-	4,9±0,08**	8,9±0,19	8,8±0,13***	8,9±0,15**
Enterococcus faecalis	5±0.06	5,1±0,03	5,1±0,12	4,9±0,12	4,9±0,03	5,3±0,19**	5,1±0,15	7±0,12
Enterococcus faecium	-	-	-	-	-	5±0,17	4,8±0,32*	4,7±0,27
Staphylococcus epidermidis	7.1±0.09	4,6±0,22	3,6±0,13	4,1±0,19	4,8±0,35	4,8±0,23	3,5±0,21***	4,4±0,12*
Citrobacter diversus	6.8±0.03**	-	-	-	-	3,5±0,27*	3,4±0,3*	4,4±0,18*
Bifidobacterium spp.	11.3±0.09*	10,9±0,12	10,3±0,51	10,8±0,08	11,3±0,15***	11,2±0,15*	11,2±0,2	11,3±0,14***
Lactobacillus spp.	9.4±0.21	9,5±0,11	9,6±0,17	9,4±0,23	9,5±0,23	9,5±0,11	9,4±0,18	9,5±0,17*

*«-» - no increasing; *p < 0,05; **p<0,01; *** p<0,001*

Quantity of *Escherichia coli* in the esophagus decreased by 1.2 times compared with the same biotope of ducks that did not receive "Olin", which amounted to 5.4 ± 0.03 lg CFU g (p <0.05). The amount of *Enterococcus faecalis, Bifidobacterium spp*. remained at the same level. A slight decrease in the number of *Staphylococcus epidermidis* to 4.6 ± 0.22 was observed, while the content of *Lactobacillus spp.* increased by 1.1 times (9.5 ± 0.11 lg CFU/g).

A decrease of *Enterococcus faecalis* in proventriculus down to 5.1 ± 0.12 and *Staphylococcus epidermidis* down to 3.6 ± 0.13 lg CFU/g was recorded relative to the indicators of ducks that received only the main diet. The content of *Bifidobacterium spp*. and *Lactobacillus spp*. increased to 10.3 ± 0.51 and 9.6 ± 0.17 lg CFU/g, respectively.

Quantity of *Enterococcus faecalis* and *Staphylococcus epidermidis* in gizzard changed slightly and amounted to 4.9 ± 0.12 and 4.1 ± 0.19 lg CFU/g. *Bifidobacterium spp.* was isolated (10.8 ± 0.08) in ducks of the experimental group, compared with the control group, and there was an increase in the number of *Lactobacillus spp*. by1.1 times (9.4 ± 0.23 lg CFU/g).

Amount of *Escherichia coli* and *Staphylococcus epidermidis* in the small intestine decreased by 1.2 times and amounted upto 4.9 ± 0.08 (p <0.01) and 4.8 ± 0.35 lg CFU/g, respectively. The amount of *Enterococcus faecalis* and *Lactobacillus spp.* slightly changed. The content of *Bifidobacterium spp*. increased up to 11.3 ± 0.15 (p <0.001), which is 1.1 times more than the corresponding indicator of ducks in the control group.

Ducks of the experimental group at 60 days of age contained *Escherichia coli* in the large intestine in the amount of 8.9 ± 0.19 lg CFU/g, which is 1.1 times more than that of ducks without the probiotic; *Enterococcus faecalis* was less by 1.2 times (5.3 ± 0.19) (p <0.01); *Citrobacter diversus* – by 1.3 times (3.5 ± 0.27) (p <0.05). Amount of *Bifidobacterium spp*. and *Lactobacillus spp*. increased by 1.1 times and

amounted to 11.2 ± 0.15 ($p < 0.05$) and 9.5 ± 0.11 lg CFU/g ($p < 0.05$), respectively. The number of *Enterococcus faecalis* and *Staphylococcus epidermidis* slightly decreased.

A decrease in the number of *Enterococcus faecalis* in cecum was found to be by 1.1 times (5.1 ± 0.15); *Enterococcus faecalis* – by1.2 times (4.8 ± 0.32) ($p < 0.05$); *Staphylococcus epidermidis* – by1.6 times to 3.5 ± 0.21 ($p < 0.001$); *Citrobacter diversus* – by 1.4 times (3.4 ± 0.3) lg CFU/g ($p < 0.05$). Along with this, quantity of *Escherichia coli* increased by 1.3 times (8.8 ± 0.13) ($p < 0.001$); as well as *Bifidobacterium spp*. (up to 11.2 ± 0.2) and *Lactobacillus spp*. up to 9.4 ± 0.18 lg CFU/g.

Quantity of *Escherichia coli* in the cloaca increased by 1.2 times (8.9 ± 0.15) lg CFU/g ($p < 0.01$); *Staphylococcus epidermidis* decreased by 1.2 times (4.4 ± 0.12) ($p < 0.05$) and *Citrobacter diversus* – by1.1 times (4.4 ± 0.18) ($p < 0.05$). The amount of *Bifidobacterium spp*. and *Lactobacillus spp*. increased by 1.1 times up to 11.3 ± 0.14 ($p < 0.001$) and 9.5 ± 0.17 lg CFU/g ($p < 0.05$), respectively. A slight decrease to 7 ± 0.12 and 4.7 ± 0.27 was observed in *Enterococcus faecalis* and *Enterococcus faecium*.

The sensitivity of microorganisms isolated from control group duck feces samples was determined for 9 chemotherapeutic medications, including: tetracycline (oxytetracycline, doxycycline), aminoglycosides (gentamicin, levomycetin), quinolones (enrofloxacin, ciprofloxacin), macrolides (nystatin, ketoconazole).

The research results showed that the majority of the selected cultures showed resistance to the tetracycline group. *Enterobacter spp*., *Proteus vuigaris* were resistant to doxycycline. The remaining cultures were slightly sensitive (Table 3).

TABLE III. SENSITIVITY OF THE IDENTIFIED MICROORGANISMS IN FECES OF DUCKS THAT CONSUMED THE "OLIN" PROBIOTIC

Chemotherapeutic medications	**Escherichia coli**	**Citrobacter diversus**	**Enterobacter spp.**	**Proteus vuigaris**	**Enterococcus faecalis**	**Enterococcus faecium**	**Candida albicans**
Enrofloxacin10%	S	S	R	S	S	S	-
Tylosin	S	S	R	SS	S	S	-
Doxycycline	SS	SS	R	R	SS	SS	-
Oxytetracycline	S	SS	R	R	S	S	-
Ciprofloxacin	S	S	SS	S	S	S	-
Levomycetin	S	S	SS	S	S	S	-
Gentamicin	S	SS	S	S	SS	SS	-
Nystatin	-	-	-	-	-	-	S
Ketoconazole	-	-	-	-	-	-	S

S – sensitive, R – resistant, SS – slightly sensitive

Enterobacter spp., *Proteus vuigaris* were also resistant to oxytetracycline. However, *Escherichia coli*, *Enterococcus faecalis*, *Enterococcus faecium* are sensitive to this drug. Intermediate sensitivity was shown by *Citrobacter Diversus* culture.

The most effective out of aminoglycoside group was the chloramphenicol, since 83.3% of the isolated cultures were sensitive. Gentamicin turned out to be less effective, because *Citrobacter diversus*, *Enterococcus faecium*, *Enterococcus faecalis* showed weak sensitivity.

Almost all selected cultures were sensitive to quinolones, with the exception of *Enterobacter spp*. This culture was resistant to enrofloxacin and slightly sensitive to ciprofloxacin.

Most of the cultures were sensitive to tylosin, this antibiotic had a weak effect on *Proteus vulgaris*, but *Enterobacter spp*. culture was resistant to this drug.

Candida albicans was resistant to antimicrobials, but was sensitive to nystatin and ketoconazole.

The results of determination of persistent properties are presented in table 4.

TABLE IV. PERSISTENT PROPERTIES OF IDENTIFIED MICRO-ORGANISMS

Culture	**ALA, μg/ml**	**ACA, c.u.**
Escherichia coli	2.2±0.3	0.1±0.01
Enterococcus faecalis	1.4 ±0.05	0.5 ±0.03
Enterococcus faecium	1.2 ±0.02	0.6 ±0.02
Citrobacter diversus	1.55 ±0.25	0.1 ±0.03
Enterobacter spp	3.1±0.3	0.5 ±0.01
Candida albicans	1.1±0.05	0.2 ±0.01
Proteus vulgaris	1.75±0.34	0.15 ±0.02

Enterobacter spp. cultures have the highest anti-lysozyme activity. (3.1 ± 0.3), *Escherichia coli* – (2.2 ± 0.3) and *Proteus vulgaris* – (1.75 ± 0.34) μg/ml. The level of severity of anti-lysozyme activity in isolates of *Enterococcus faecalis*, *Enterococcus faecium*, *Citrobacter diversus*, *Candida albicans* is in the range of 1.1-1.55 μg/ml.

The highest level of anti-complementary activity was observed in Escherichia coli, Citrobacter diversus, and Proteus vulgaris, with a maximum complement concentration at the point of application, a hemolysis zone was not formed. The lowest level of AKA was in Enterococcus faecium.

One of the factors contributing to the survival of microorganisms in the environment, as well as the colonization of microorganisms, is adhesion.

The results of the study of the adhesion of microorganisms are presented in table 5.

TABLE V. ADHESIVE PROPERTIES OF MICROORGANISMS

Culture	**C, %**	**MAI**	**AAI**
Escherichia coli	81.3±2.5	5.0±0.19	6.15
Enterococcus faecalis	84.6±1.9	4.31±0.21	5.1
Enterococcus faecium	77.2±2.3	3.7±0.15	4.8
Citrobacter diversus	85.1±5.3	3.31±0.4	3.9
Enterobacter spp	76.3±2.1	2.2±0.8	2.88
Candida albicans	67.9±3.1	2.4±0.33	3.6
Proteus vulgaris	89.4±0.8	6.12±0.18	6.84

The isolated microorganisms for the most part had a high and slightly less than average degree of adhesion. Low-adhesive or non-adhesive bacteria were not isolated.

Studies conducted with the assessment of production indicators showed that already 7 days after the use of the probiotic, difference in live weight was revealed which amounted to 1.3 g/duck. At two weeks of age, the live weight of ducks in the experimental group was 39.1 g more, at 35

days – 46.5 g/duck. Before slaughter (60 days of age), the difference reached 235.7 g/duck (Table 6).

TABLE VI. DYNAMICS OF LIVE WEIGHT OF DUCK-BROILERS DURING THE EXPERIENCE

		Group		
		Control (g)	***Experimental (g)***	***Difference between groups (g)***
Age in days	1	57.7±1.44	57.9±1.57	0.2
	7	158.2±4.92	159.5±4.25	1.3
	14	474.5±10.09	513.6±14.07	39.1
	35	1887.9±46.08	1934.4±40.35	46.5
	60	2771.4±55.48	3007.1±35.23	235.7

The biochemical analysis made it possible to evaluate a number of indicators of the nutritional value of duck meat of the experimental and control groups (table 7).

TABLE VII. BIOCHEMICAL ANALYSIS OF DUCK MEAT AFTER ADMINISTRATION OF THE "OLIN" PROBIOTIC (PER 100 G)

Indicators	Control	Experimental
Water content	53.4±0.75	53.06±0.7
Mass fraction of protein	17.6±0.35	18.63±0.14
Mass fraction of fat	27.0±0.3	27.43±0.7

It was established that the meat of ducks of the experimental group at 60th day of age contained water lesser by 0.6% (53.06 ± 0.7); protein – 5.9% higher (18.63 ± 0.14); fat – 1.5% higher (27.43 ± 0.7), compared with the control group.

Thus, a comprehensive study allows us to conclude that by the age of 60 days (slaughter age of ducks), the dominant members of the microbiocenosis of the studied biotopes of the gastrointestinal tract in the experimental group using probiotics were: *Enterococcus faecalis*, *Staphylococcus epidermidis*, *Escherichia coli*, *Bifidobacterium spp*. and *Lactobacillus spp*. The isolated microorganisms possessed morphological, tinctorial and biochemical properties typical of their taxonomic position. While the control group showed a decrease in the amount of beneficial biota, but increase of *Proteus vulgaris* and *Klebsiella pneumoniae*.

When studying the biological properties of isolates of opportunistic bacteria isolated from the 2nd group, their high persistent potential was revealed. The highest level of ALA was found in *Enterobacter spp*. – 3.1 μg/ml, *Escherichia coli* – 2.21 μg/ml and *Proteus vulgaris* – 1.75 μg/ml. Bacteria possessed a high degree of colonization ability. On average, the microbial adhesiveness index (MAI) varies from 2.88 to 6.84 with a fairly high AAI – from 2.2 to 6.12. The vast majority of microorganisms were highly sensitive to enrofloxacin – 83.3%, tylosin – 66.6%, ciprofloxacin and chloramphenicol – 83.3%. At the same time, isolated *Enterobacter spp.* cultures were resistant to the most of the tested antibacterial drugs (doxycycline, oxytetracycline, enrofloxacin and tylosin). *Proteus vulgaris* showed 100% resistance to doxycycline and oxytetracycline.

IV. CONCLUSION

The administration of a probiotic preparation for the prevention of dysbiosis contributed to an increase in the content of lactobacilli and bifidobacteria and a decrease in the number of opportunistic microorganisms in all sections of the gastrointestinal tract of ducks. In addition, the introduction of "Olin" into the ducks' diet contributed to an increase in live weight by 8%, as well as a decrease in feed conversion by 8%, and an improvement in the biochemical composition of duck meat.

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