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EVALUATION LACTIC ACID BACTERIA AUTOSTRAINS WITH ANTI-*CAMPYLOBACTER JEJUNI* ACTIVITY ON BROILER CHICKENS PRODUCTIVITY

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ABSTRACT

Modern poultry farming is based on preventing zooanthroponotic infections by targeted regulation of the intestinal microbiota using a wide range of probiotic preparations. This article reflects the results of a study on feeding broiler chickens with a feed additive containing autostrains of lactobacilli with anti-*Campylobacter jejuni* (*C. jejuni)* activity in comparison with intact chickens. As a result of the studies, autostrains of heterologous lactobacilli with activity against Campylobacter on the zootechnical parameters of growing broiler chickens "Cobb-500" was shown. Thus, the introduction of a feed additive based on lactobacilli, in general, had a positive effect on the productivity of broiler chickens.

Disciplinary: Agricultural and Animal Sciences, Microbiology; Bioscience.

1 INTRODUCTION

Modern poultry farming is based on preventing zooanthroponotic infections by targeted regulation of the intestinal microbiota using a wide range of probiotic preparations. The choice of the optimal probiotics for the prevention of campylobacteriosis in broiler chickens is relevant.

There are researches focused on the use of probiotics for the prevention and treatment of gastrointestinal tract infections caused by *Campylobacter jejuni* (*C. jejuni*) and *S. enteritidis*. In the works (Fooks and Gibson 2003; Fernández, et al., 2003), shown that symbiotic strains isolated from humans, L. Plantarum 0407 and Bifidobacterium bifidum Bb12, in the presence of oligofructose and

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xylooligosaccharides inhibited the growth of *C. jejuni*, *in vitro* and *in vivo*. Similar results used lactobacilli and bifidobacteria isolated from chickens (Chaveerach et al., 2004). In Tsai et al. (2005), lactobacilli strains isolated from pigs and chickens exhibited antagonistic activity against *Salmonella spp in vitro* and *vivo*. Intact mobile flagella refer to the factors providing adhesion and survival of *C. jejuni* (Woodall et al., 2005). The flagellin locus contains two adjacent genes fla A and fla B (Hendrixson et al., 2001; Nuijten et al., 1990; Woodall et al., 20059). The intestinal environment, pH, viscosity, and various metabolites affect these genes (Sherman et al., 2009). Mucin stimulates the adhesion and internalization of *C. jejuni* into intestinal cells (Byrne et al., 2007; Szymanski, et al., 1995). The intestinal microaerophilic environment promotes the growth and reproduction of *C. jejuni*. The presence of probiotics inhibits the growth and reproduction of *C. jejuni* and prevents the penetration of the pathogen into the submucosal layer (Aguiar et al., 2013; Alemka et al., 2010). Exposure of *C. jejuni* cells to the probiotic impairs the pathogen's mobility and its ability to colonize the intestinal epithelium *in vitro* and *in vivo* experiments (Alemka, et al., 2010).

A comparative assessment of *B. subtilis* and *C. jejuni* under the conditions of the chicken gastrointestinal tract showed that *B. subtilis*, upon contact with *C. jejuni*, increases its mobility, reaches the crypts of the cecum more quickly, and occupies all binding sites. B. subtilis prevents the interaction of *C. jejuni* with the host organisms epithelial cells, limiting the mobility and survival of the pathogen (Aguiar et al., 2013). The addition of the probiotic feed additive Cellobacterin-T based on B. subtilis to broiler chickens' feed reduced the level of *C. jejuni* in the microbiota of the blind spines of the bird's gastrointestinal tract. A significant drawback of *B. subtilis* strains used as probiotics and probiotic feed additives is their feeble ability to adhere to the gastrointestinal tract's epithelial cells, in contrast to lactobacilli and bifidobacteria.

The study aimed to feed broiler chickens with a feed additive containing autostrains of lactobacilli with anti-*C. jejuni* activity in comparison with intact chickens.

2 MATERIALS AND METHODS

Broiler chickens of the Cobb 500 cross were rising within 35 days. The scheme of the experimental groups is in Table 1.

Table 1: Experiment scheme on broiler chickens

Group	Features of incubation and feeding of poultry
Control	Broilers chickens obtained after incubation of intact eggs. Feeding: basic diet
2	Broilers chickens obtained after incubation of eggs with introduced heterologous bacteria. Feeding: basic diet
3	Broilers chicks obtained after incubation of eggs with an injected sample without bacteria (violation of the egg). Feeding: basic diet
4	Broilers chickens obtained after incubation of intact eggs. Feeding: essential diet with the introduction of a feed additive containing heterologous lactic acid bacteria

For obtaining broiler chickens containing in the intestine strains of lactobacilli with activity against Campylobacter, into the incubation egg were introducing probiotic lactobacilli.

Chickens obtained after incubating intact eggs (without introducing bacteria) were used as a control group. Experiments on broiler chickens were in the vivarium of the International Laboratory of Molecular Genetics and Poultry Genomics (Federal State Budgetary Educational Institution of Higher Education "Moscow State Academy of Veterinary Medicine and Biotechnology - MBA named after K.I. Skryabin"). The ration of the breeder chickens was according to the recommendations of VNITIP (Fisinin et al, 2000; Egorov et al., 2019).

The chickens were in individual cages, observing the same technological parameters for growing (see Figure 1).

Figure 1: Chickens in individual cages, the same technological parameters of growing.

3 RESULTS AND DISCUSSION

Poultry feeding was in two phases (6-21 days and 22 days until the end of rearing). Complete feed was as the main diet for the experimental bird. Compound feed recipes are in Table 2.

Table 2: Recipes of compound feed for broiler chickens.

Ingredients	Age, days			Ingredients	Age, days		
	1-10	11-24	25-35		1-10	11-24	25-35
Yellow-grained corn	50.5	49.35	46.45	In 100 g of compound feed			
Wheat	6.00	-	-	Exchange energy, kJ	1268	1295	1307
Triticale	-	6.00	9.00	Crude protein,%	22.21	22.21	21.12
Soybean meal	30.00	31.00	27.00	Crude fiber,%	3.39	3.39	3.67
Sunflower meal	3.50	4.00	5.00	Crude fat,%	6.20	6.20	7.98
Fish flour	4.00	2.00	-	Calcium,%	1.08	1.08	1.04
Meat and bone meal	-	-	4.00	Phosphorus,%	0.76	0.76	0.78
Rapeseed oil	1.70	3.30	4.30	Sodium,%	0.17	0.17	0.18
Monocalcium Phosphate	1.30	1.20	1.25	Lysine,%	1.460	1.369	1.261
a piece of chalk	1.15	1.15	1.00	Methionine + cystine,%	1.072	1.030	0.988
Premix	2.00	2.00	2.00	Tryptophan,%	0.284	0.278	0.265

For the first five days, all groups' chickens received the same pre-starter compound feed by Ponomarenko et al., 2012. A feed additive containing lactobacilli for chickens of the 4th experimental group was starting from the 6th day of rearing. Chick weight results are in Table 3.

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Table 3: Results of broiler chickens control weighing

Growing period	1st (control) group, g/head	2nd group, g/head	3rd group, g/head	4th group, g/head
1 (1-7 days)	212.6±4.32	258.3±3.24***	261.7±3.53***	269.3±3.54***
2 (8-14 days)	408.5±6.54	575.8±5.73***	593.5±5.32***	610.2±5.64***
3 (15-21 days)	751.4±8.63	970.8±7.31***	1005.3±7.75***	1030.6±7.64***
4 (22-28 days)	1264.8±10.87	1481.2±9.54 ***	1498.4±9.53 ***	1515.8±9.62 ***
5 (29-35 days)	1835.3±13.96	2091.0±11.46 ***	2100.1±11.54 ***	2150.5±11.31 ***

Note: * P > 0.95; ** P > 0.99; *** P > 0.099.

The safety of broiler chickens in all groups was 100%. Indicators in Table 2 reflect that in all periods of growing broiler chickens of the 4th group, significantly exceeded the analogs of the control group in live weight and the analogs of the 2nd and 3rd experimental groups.

The results of the consumption of feed by control and experimental groups are in Table 4.

Table 4: Feed consumption per 1 kg of live weight gain of broiler chickens

Indicators	Group			
	1	2	3	4
Feed consumption per 1 kg of growth for the entire growing period, kg	1.98	1.88	1.86	1.81
By % to control	100	94.9	93.9	91.4
Feed conversion, kg	-	0.10	0.12	0.17
By % to control	-	5.1	6.1	8.6

Feed consumption per 1 kg of live weight gain of "Cobb-500" cross broiler chickens in all experimental groups decreased in comparison with the 1st control group, in the 2nd group by 5.1%, in the 3rd group by 6.1%, and in the 4th group by 8.6%.

4 CONCLUSION

The introduction of lactobacilli into eggs generally had a positive effect on reared broilers' performance. The introduction of under-shell strains of lactobacilli with anti-*C. jejuni* activity and incubation of eggs for 21 days to obtain broiler chickens containing lactobacilli autostrains in the intestinal caecum with anti-*C. jejuni* activity is promising for the prevention of campylobacteriosis.

5 AVAILABILITY OF DATA AND MATERIAL

Data can be made available by contacting the corresponding authors

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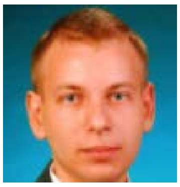

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