Endosymbiotic properties of eubiotic STF: an alternative therapeutic mean of chemotherapy in poultry industry

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The high incidence of food-born pathogens in raw meat and eggs together with a high level of therapeutic, prophylactic and nutritional applications of antibiotics in poultry industry reveals an antibiotic resistance problem of global dimensions. Reduction of the use of anti-microbial agents has suddenly leapt to prominence as a result of the decision of the EU to remove several antibacterial agents from the use in animals feed. These factors have renewed the interest and the possibility to use the probiotics to chickens (ch.) as an alternative mean to chemotherapy in gastrointestinal disorders of broilers. Probiotics can be also an attractive treatment since they do not delay recolonization of normal microflora as antibiotics do. In this work we analyzed the role of the commercial eubiotic-probiotic STF (made in Lithuania) in the removal of chemotherapy and improvement of growth conditions of Isa Vedette broilers. The STF used by us consists mainly of alive endosymbiotic *Enterococcus faecium* (10×10^{12} cells/g) cells. The control group of c. (n = 27200) got only chemotherapy, all rest 7 groups (n = 189360) got antimicrobial medicines and STF in an aerosol way and *per os* in various schemes. Ch. were grown to 45–48 days. The results of clinical trials showed that the multiple and permanent use of chemotherapy rose a deep harm of microendoecology of ch., which has been corrected by STF; it improved the physiological status of ch., increased their survival (1.2–3.5%) and weight gain (2–13%). Moreover, the probiotic STF decreased the amount and shortened the duration of antibiotics applied to chickens with already formatted microendoecology by 60% and 55%, respectively, and can be strongly recommended as an alternative therapeutic means for prevention of intestinal disorders.

Key words: probiotics-eubiotics, chickens, intestinal microflora, industrial poultry

INTRODUCTION

Antibiotics are synthetic or natural chemical substances synthesised by the microorganisms, plants and eucariotic cells that suppress their growth and development. Starting from the initiators of chemotherapy P. Ehrlich (discovered salvarsan in 1910), A. Fleming (discovered penicillin in 1929), G. Domagk (discovered red streptocid in 1935) the production and usage of synthetic antibiotics, especially for the treatment of domestic animals, grew up dramatically. Antibiotics (A.) have also been used in the treatment and prevention of infectious diseases in humans, animals, crop, fruit trees, ornamental plants [13, 21, 23, 25]. All classes of antimicrobials in Europe are licensed for the disease therapy in humans and registered for the usage in animals [20]. The quantity of A. used in plant disease control is less than 0.1% of the total usage of A. in the USA [13]. Animals are regularly exposed to A. One half of A. produced today get animals with the feed (birds, pigs, sheeps, goats, cattle), either for the mass treatment against infectious diseases or for growth promotion [12, 17]. It is also known that the hugest amounts of desinfectants and drugs, antimycoplasmics and anticoccidiostatics are widely used every week for growth promotion in poultry industry. The use of avoparcin and ardacin (glycopeptides), closely related vancomycin, teicoplanin, tylosin, spiramycin (macrolide antibiotics), bacitracin (mixture of cyclic polypeptides), monensin and salinomycin (carboxylic ionophore), carbadox and olaquindox (quinoxalines) at sub-therapeutic levels is an integral part of modern

chemotherapy in poultry [4, 23]. Moreover, it is known that 5–10% of the final cost for one kilogram of live broiler will be spent on therapy [1].

The concept of biosecurity is not well accepted, there are no compulsory regulations. The detection, invention, and global usage of A. and antimicrobial agents in humans, poultry, animals, agriculture and aquaculture have initiated the "Darwinian" experiment bringing about the survival of resistant microorganisms coupled with the elimination of susceptible ones in antibiotic-containing environments [2, 22]. Fifty years of increasing application of antimicrobial agents created a situation leading to an ecological disbalance [12]: the enrichment of multiple-antibiotic-resistant bacteria, not only among pathogens but also among commensal bacteria, in human and animal habitats. Recently, the European Union decided to ban the use of four widely used A. (tylosin, virginiamycin, spiramycin, and zinc bacitracin) as animal growth promoters [20, 22]. As a consequence, there is an urgent need to seek an alternative treatment to A. to enhance the health status and production performance of domestic animals. So, the contemporary ecological problems force us to search for a new, more biological ways of treatment.

A comprehensive study of the composition of normal microflora and the strains of species that play a role in the improvement of host's health, prevention and treatment of gastrointestinal disorders such as antibiotic-associated diarrhea as well as the application of certain probiotics [6, 7, 18, 24] that further delay the recolonization of normal microflora are recommended. In this work we analysed the role of the eubiotic-probiotic STF (STF) in the prevention of harmful effects or removal of chemotherapy from the poultry industry.

MATERIALS AND METHODS

The growth of chickens-broilers (Isa Vedette breed) was observed for 1–45–48 days. They were housed in a commercial standard farmhouse of an industrial poultry joint stock (farm) in Lithuania. Eight groups of one-day life chickens (weight 52–64 g) were formed in the poultry farms under natural growth conditions. According to the prevention program of animal Health Care Center of Lithuania all birds were vaccinated against Marek disease, infectious bronchitis and infectious bursal disease. They got commercial antimicrobial medicines: farmazin (Far), furazolidone ((Fur), nitrofuran), quinabic ((Qui), the quinolon of third generation), aprolan (Apr), agrisept (Ag), lincospectin premix (Linc), imaquil (Im), salmonil (Sal), chloramphenicol (Chl), apromycin (Apr), gentamycin (Gen) and the eubiotic-probiotic STF. STF is a commercial product (Fsvet 1195388-1-99, series No. 6), mainly consisting of alive *Enterococcus faecium* cells isolated from chicken intestine. It is a homogeneous, cream-colored powder with a specific smell, well suspended in water. The activity of STF is based on the stimulation and formation of resistance of gut biocenosis, inhibition of the growth of *Salmonella* spp. *in vitro* and *in vivo*, correction of the metabolism of proteins and carbohydrates, elimination of dangerous xenobiotics from the microflora, correction of immunobiochemical processes after *Salmonella* spp. infection or antibiotic treatment [11, 29]. STF was applied to all sorts of birds, calves, piglets to protect them from dysbacterioses of different ethiology, infections spread through the feed (*Salmonella, Escherichia coli, Campylobacter* and others) for treatment and prophylaxis, to increase the general resistance of the organism and the quality of production. Before used to chickens, the concentration and antimicrobial activity of viable *Enterococcus faecium* cells of STF had been estimated by the growth in the medium together with HCl, laevomycetin, enrofloxacin, lincospectin, penicillin G, erythromycin, furazolidone, gentamycin, kanamycin and HgCl according to the test of serial dilution [14]. A scheme of the use of antimicrobial medicines and STF in chickens is shown in Table 1. The control group (No. 1, n = 27200) of chickens got only antimicrobial medicines, all the rest seven groups (Nos. 2–8, n = 189360) got antimicrobial medicines and STF. The antimicrobial medicines were administered with drinking water and feed as indicated by producer. STF in the form of aerosol was sprayed over 20th-day hatching eggs or administered to chickens with feed or drinking water as shown in Table 1. STF was administered in agreement with the requirements of the Instruction of usage of STF registered 26 May 1993, No. 3–8 and 15 December 1999, No. 4–326.

The physiological condition (status) of chickens was investigated by the method of clinical observation, biochemical and microbiological analysis. One, 5, 16 and 30 days old chickens of the first and eighth groups (5 chickens out of each) were euthanized by cervical dislocation after transportation to laboratory. The gastrointestinal tract was isolated and the content of the small intestine was analysed microbiologically. Samples were diluted with saline solution (NaCl, 8.5 g/l). For the count of total amount of aerobic viable bacteria of *Enterobacteriaceae*, enterococci, lactobacilli species dilutions were spread and plated on the appropriate selective agar plates and incubated at 39.0 °C for 24, 48 and 72 h as described by [28]. Numbers of CFU (colony formatting units) are expressed as log of CFU per gram

Table 1. **Scheme of administration of antibiotics and STF to chickens**

Group	Number of analyzed chickens	Sort of antibiotics and duration, days (d)	Use of STF-way and duration, days (d.)	Duration of chickens' growth, days
1	27200	Far at 2–5 d., Apr at 6–8 d., and 11–12 d., Fur at 7–12 d., Qui at 24–29 d., Ag at 30–33 d. and 38–41 d.	Not used	48
2	27200	Linc at 1–7 d., Fur at 8–14 d., Im at 27–30 d., Sal at 28–29 d., Ag at 36–40 d.	11–14 d., with water	47.5
3	26880	Fur and Chl at 1–8 d., Ap at 11–14 d., Qui at 25–28 d., Ag at 29–31 d. and at 33–36 d.	21–26 d., with feed	45
4	27360	Im at 4–7 d., Qui at 8–14 d., Ag at 29–31 d. and at 34–38 d.	12–16 d., 19–22 d. with feed	45
5	26880	Lin at 1–14 d., Gen at 31–33 d.	10–13 d. with water, 19–24 d. with feed	45
6	25760	Lin at 1–14 d., Gen at 31–33 d.	10–15 d. with water, 18–21 d. and 24–25 d. with feed	45
7	28240	Linc at 1–7 d., Fur at 7–14 d., Ag at 28–34 d..	Drop–spray, 11–13 with feed	48
8	27040	Qui at 4–8 d., Fur at 10–15 d., Ag at 39–40 d.	Drop-spray, 8–10 and 19–24 with water	47.5

Notes. 1. The antibiotics were administered with drinking water and feed in doses directed in the instructions of their usage. 2. Water and feed were given ad libitum to all broilers.

of intestine (log/g). For the biochemical analysis the blood of control and analysed group of chickens was taken and the blood serum was analyzed spectrophotometrically. The general amount of proteins (method of Lowry), glucose (with the reagent of O-toluidin), lactate (with para-oxidimethyl), pyruvate (with 2.4-dinitrophenylhydrasine) [27] and IgM and IgY with monospecific antiserum was detected [33]. The decreased amount of antibiotics, shortened duration of their usage and the effect of STF were estimated by the physiological indices of broilers' status, their vitality and by the increased daily weight gain indicated in the technical growth card of broilers, compared to the broilers (control group) that did not get STF.

RESULTS AND DISCUSSION

The results of investigation of STF show that 1 g of the preparation contained l00 bill. of alive *Enterococcus faecium* microbial cells (m.c.), tested as previously described. The cells of STF grew in the medium containing 100 μg/ml HCl, 5 μg/ml laevomycetin, 5 μg/ml enrofloxacin, 10 μg/ml lincospectin, 10 μg/ml penicillin G, 10 μg/ml erythromycin, 1000 μg/ml furazolidone, 100 μg/ml gentamycin, 100 μg/ml kanamycin and 10 μg/ml HgCl. This shows that the used concentrations of different chemicals do not inhibit the growth of STF cells and can be recommended for chicken treatment with antimicrobial medicines.

Chickens-broilers were grow for 45–48 days. Data in Table 1 show that start froming the first day of chickens' life various antimicrobial and immunodepresant chemotherapy were used prophylactically to prevent infectious diseases. The control group (1, n = 27200) of chickens got only antimicrobial medicines (5 antibiotics during 29 days) and all the rest seven groups (2–8, n = 189360) got antimicrobial medicines (5 to 2 antibiotics for 25–13 days) and STF. The microbial test of chicken intestine hatched in the industrial incubator showed the low content and variability of microorganisms (1.4 ± 0.01 – 2.4 ± 0.01 log/g). However, the intestine microflora of the control and treated groups of chickens was developed unequally (data on chickens' intestine test are presented in Table 2). As one can see, the chemotherapy damaged the most important defence system of chickens intestine microendoecology, which plays the main role in the formation of chickens' immune system. In the intestine of chichens that got farmazin at the first 2–5 days of their life a higher content of small intestine *Enterobacteriacea, Staphylococcus* and a lower content of *Lactobacteria* spp. were found. Moreover, a deficiency of lactobacteria was noted until the 30th day of their life. In the intestine of chickens of the parallel experimental group which got STF as an aerosol in their

Table 2. **The effect of antibiotics and STF on the microflora of chicken intestine**

Group of chickens	Microorganisms found in the intestine	Content of microorganisms log/g in the intestine of chicken			
		1 day old	5 days old	16 days old	30 days old
1. Control group (got only antibiotics)	*Enterobacteriacea*	8.9 ± 0.62	1.5 ± 0.65	1.3 ± 0.25	1.1 ± 0.35
	Enterococci	1.7 ± 0.42	2.1 ± 0.73	<1.02	<1.02
	Staphylococci	<1.02	2.0 ± 0.73	2.1 ± 0.63	3.2 ± 0.13
	Lactobacteria	<1.02	1.6 ± 0.73	4.4 ± 1.43	4.6 ± 0.12
2. Experimental group (got antibiotics and STF)	*Enterobacteriacea*	8.9 ± 0.62	3.3 ± 0.13	1.1 ± 0.72	7.5 ± 0.42
	Enterococci	1.7 ± 0.42	7.3 ± 0.23	4.6 ± 0.14	4.3 ± 0.74
	Staphylococci	<1.02	<1.02	1.7 ± 0.13	<1.02
	Lactobacteria	<1.02	3.9 ± 0.13	6.9 ± 0.14	9.6 ± 0.24

hatching period and *per os* at the 8th–10th day of their life (quinabic and furazolidone was applied on days 4–8 and 10–15), the content of enterococci and lactobacteria in the small intestine was increasing and covered other microorganisms of the intestine on the 30th day of chickens' life, in contrast to the group that did not get STF. This means that STF affects the development of lactobacteria, corrects and renews the microendoecology of the intestine after chemotherapy.

There were changes in blood serum as well. The content of protein, glucose, lactate and pyruvate after the usage of furasolidone was 34.9 ± 1.98 g/l, 10.9 ± ± 0.31 mmol/l, 4.51 ± 0.55 mmol/l and 0.312 ± ± 0.016 mmol/l; after STF 37.6 ± 1.89 g/l, 12.2 ± ± 0.20 mmol/l, 5.15 ± 0.37 mmol/l, 0.360 ± ± 0.01 mmol/l and after furasolidone and STF 39.1 ± ± 1.54 g/l, 11.8 ± 0.40 mmol/l, 5.03 ± 0.52 mmol/l and 0.344 ± 0.011 mmol/l. The same effect was observed in the chickens' blood immunoglobulins. The content of IgY and IgM after furasolidone was 2.81 ± 0.14 and 0.035 ± 0.011 mg/ml, after the usage of STF 2.893 ± 0.22 and 0.073 ± 0.016 mg/ml, and after usage of furasolidone and STF 2.90 ± 0.16 and 0.074 ± 0.017 mg/ml, respectively. Our data show the regeneration of microendoecologic and metabolic processes by STF after antibioticotherapy.

In spite of the quantity and duration of the chemotherapy, used the mortality of chickens in the control group that did not get STF was highest (9.75%). However, the cause of death was not estimated; it seems that the effectiveness of antibiotics in poultry industry sometimes can be doubtful. The main cause was probably the harmful side effects of intensive antibiotic treatment: for example, the chickens at the first 2–5 days of their life got farmazin (macrolid) that could damage their sensitive microflora. After that the natural metabolic changes started inside the chickens bodies [8, 30]. If a few antibiotics were used with short intervals inbetween (aprolan and furasolidone one day after farmazin), the endoecological disbalance in chickens was even deeper. It has been determined that furasolidone even at a single or 5-day application (5–10 mg/kg) can provoke a decrease of amino acids in the liver [32]. Another antimicrobial used in chickens' treatment, quinabic (chinolonic class), passes through the haematoencephalic barrier and enters the brain and internal organs. The result of treatment was a decreased level of glucose and proteins in the chickens' blood, which affects their immunophysiological resistance and increases chickens' mortality. As an alternative to the chemotherapy we have used STF as a spray and per os. Contrary to the antibiotics, the symbiotic cells of *Enterococcus faecium* stimulated the microendoecology of younger chickens and helped them to adapt to the new way of life and nutrition conditions. As we can see from Table 3, the usage of STF in all 7 groups (2–8) of chickens increased the weight of chickens and decreased their mortality.

We noted, the way and duration of usage, and the age of chickens influenced the effect of STF. Chickens of groups 5, 6, 8 who got STF from the 8th–10th day of their life got half as little antibiotics as the others did. The highest effect was noted in group 8 of chickens who got STF in three different ways: as an aerosol to the chicken, during the hatching period, and *per os* before and after antibiotics at days 8–10 and 19–24 of their life. Even if the chicken got chemotherapy, the mortality in that group was much less (6.4%) and the weight of carcass was highest (1951 g).

The effect of STF could be built on the concept of competitive exclusion described in [6, 7, 15]. Before the use of chemotherapy, symbiotic cells of *Enterococcus faecium* were sprayed into the incubator. *Enterococcus* cells from the normal microflora of chickens stimulated the development of biocenosis and increased colonisation resistance of their in-

Table 3. **The effect of STF on the antimicrobial treatment of chickens**

Group	Frequency* and duration** of usage of antibiotics	Frequency* STF and duration** of usage of	Mortality, %	Survival****, %	Weight gains, g/24 h	Carcass weight, g	Prime cost of 1 kg carcass (Lt)***
1	5/29	0/0	9.7	90.2	35.7	1760	7.22
2	5/25	1/4	8.3	91.7	36.5	1775	7.17
3	5/23	1/6	8.4	91.5	38.0	1781	7.19
4	3/19	2/8	8.2	91.7	41.0	1885	7.18
5	2/17	2/10	6.8	93.1	39.8	1805	7.18
6	2/17	3/9	6.7	93.1	41.1	1895	7.17
7	3/21	2/4	8.0	91.8	40.0	1920	7.16
8	3/13	3/9	6.4	93.5	41.0	1951	7.15

Note: *frequency in time, **duration in days, ***% of surviving chickens consists of 100 minus (dead + utilised chickens x 100/total amount of chickens). *** 1 USA $ equals to 4 Lt.

testine. STF applied on days 8–10 after quinabic rebuilt and maintained the stability and balance of biocenosis and detoxicated xenobiotics. The microflora of the intestine of chickens acts as a biosorbent and is a prime target for various compounds applied *per os*; this way was more effective as compared to the aerozolic way. The advantage of the oral way is the size and surface of the intestine which is 4–5 times larger than the surface of respiratory tract [10]. STF *per os* can better penetrate the body and spread in it through the mucosa of the intestine than that if respired by air or skin. The best way to use STF was application with drinking water and not with food, since all soluble materials much quicker than solid ones from the stomach reach the intestine. STF stimulated the microendoecology of the body, influenced the metabolism of proteins and carbohydrates, and developed an unspecific barrier of defence. The strong and stabile endoecology of chickens eliminated the side effects of chemotherapy and recovered the microendoecology of the intestine. The use of STF was beneficial for the health of chickens, as it improved their intestinal microbial balance, physiological functions and survival (up to 93.5%), weight gain (36.5–41.1 g/day) and decreased the prime cost of 1 kg of carcass.

The results of our experiments showed that the control group of chickens is a perfect model to show the consequences of intensive chemotherapy. We have used a broad spectrum of antibiotics at the most vulnerable periods of chickens' life, *i. e.* the first three weeks when the intestine is deficient of indigenous bacteria, the immunocompetitive system is week and the blood contains least of inherited antibodies. Chemotherapy *per os* during the first weeks of chickens life smother the development of microflora, and the immunophysiological functions of the organism, reduced efficiency of feed conversion do not protect chickens from dysbacteriosis and increase their mortality. According to many authors, the microflora of the gastrointestinal tract of chickens plays an important role during the first 6–8 days of their growth [19, 15]. In 0 to 4-day old broilers, *Enterobacteriaceae* and *enterococci* are dominant in the cecum, and play the leading role in the health status and growth intensity. The number of viable bacteria decreases in the cecum when broilers grow older (15 days), but this decrease seems to be dependent on the diet fed and chemotherapy [3]. The authors in the Netherlands [26] fed chickens with nicarbazin (100 mg/kg) and zinc bacitracin (25 mg/kg) in the first 1–10 days, from day 11 to day 32 their feed contained salinomycin (70 mg/kg) and zinc bacitracin (50 mg/kg). The results showed that acetate, butyrate, and propionate in 1-day-old chickens' intestine was at the undetectable level, increased until the 15th day of their growth, and then stabilised. A significant negative correlation could be traced between the content of *Enterobacteriaceae* and the concentration of undissociated acetate, propionate, and butyrate. It is concluded that volatile fatty acids are responsible for the reduction of *Enterobacteriaceae* in the cecum of broiler-chickens during their growth. M. Teuber [22] estimated that medicinal doses of tetracycline, lincomycin, cefalexin, rifamycin caused not only changes in intestinal lactobacilli, but also in the antibiotic resistance and antagonistic activity. At this moment the treatment of infectious diseases is compromised by the development of antibiotic-resistant strains of microbial pathogens. Resistant bacteria, following their

emergence and evolution in the presence of antibiotics, appear to acquire a 'life of their own'. They proliferate and maintain the resistance traits even in the absence of antibiotics, thus jeopardizing the reversal of bacterial resistance by simple reduction in antibiotic use [2, 25]. Reversing resistance requires restoration of the former susceptible flora in people, poultry, animal and in the environment.

The industrial technologies of broiler growth encounter many intestinal disoders in which probiotics have been used prophylactically and/or thereapeutically, but the role of disruption process of normal flora in the disease is less clear. These diseases include coccidiosis, colibacteriosis, salmonelliosis, campylobacteriosis, antibiotic-induced diarrhoea, viral diseases and other negative factors of storage or feeding. However, the scientific basis of using probiotics in poultry has been established only recently, and clinical studies have begun to be published.

Many studies have been focused on *Lactobacillus and Bifidobacterium, Streptococcus, Enterococcus.* They have been carried out to elucidate the mechanisms of bacterial adhesion and the ability of these bacteria to inhibit the adhesion of pathogens to the intestinal mucous [7, 24]. However, there are very few studies, if any, on the adhesion of enterococci and their inhibition of the adhesion of pathogens to the intestine. More than 60% of probiotic preparations in the market contain strains of enterococci [5] of unknown origin. For that reason, there is a high risk for the recipients-chickens to get non-symbiotic microorganisms.

Our results concerning the effect of STF on the microflora of chickens agree with the results of other authors. However, there was no literature about STF in chemotherapy. Kumprecht et al. [9] estimated that *Streptococcus faecium M-74* used together with food of birds increased the concentration of lactic acid and the activity of cellulase in the cecum and improved the rate of digestibility and sugar (from fibre degradation). Owings et al. [16] showed that feed efficiency and body weight were significantly ($p < 0.05$) better in broilers receiving *S. faecium M-74* in the feed and in the water than in those receiving antibacterial products alone. It is difficult to compare the effect of STF with data of other studies, because the authors used different compounds and bacteria strains, different compositions of preparations and schemes of their usage. On the other hand, differences in birds, growth technology and ecological conditions can influence the results of experiments. We conclude that the endosymbiotic eubiotic-probiotic STF made in Lithuania could be a good alternative to chemotherapy and useful for protecting the digestive tract of chickens under industrial poultry conditions.

CONCLUSIONS

1. The multiple and permanent use of antibiotic therapy causes deep harm to microendoecology, which has been corrected by the eubiotic-probiotic STF. It regenerated, softened and improved the physiological condition of chickens, increased their survival (1.2–3.5%) and weight gain (2–13%).

2. The mechanism of action of endosymbiotic eubiotic STF made from alive *Enterococcus faecium* cells is displayed by enhanced development of microendoecology and colonisation resistance of chicken intestinal, better metabolism of proteins and carbohydrates, correction of IgM and IgY levels, strengthening of the physiological functions of chickens.

3. The preparation STF decreased the amount and duration of antibiotics applied to chickens with already formatted microendoecology by 60% and 55%, respectively, and can be strongly recommended as an alternative means of preventing gastrointestinal disorders in chickens.

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EUBIOTIKO STF ENDOSIMBIONTINĖS SAVYBĖS – ALTERNATYVI GYDYMO PRIEMONĖ CHEMOTERAPIJAI PRAMONINĖJE PAUKŠTININKYSTĖJE

S a n t r a u k a

Šiame darbe buvo tirta endosimbiontinio eubiotiko-probiotiko STF įtaka Isa Vedette kroso viščiukams broileriams, siekiant mažiau naudoti chemoterapiją pramoninėje paukštininkystėje. Naudotas Lietuvoje pagamintas komercinis preparatas STF (serijos Nr. 6), kurį sudaro gyvos (miltelių pavidalo) *Enterococcus faecium* kamieno ląstelės. Pagal paukščių sveikatos priežiūros programą, kontrolinės grupės viščiukai (n = 27200) gavo tik antibiotikų, o 7 bandomųjų grupių viščiukai (n = 189360) – antibiotikų ir STF (variantai įvairūs). Viščiukai augo 45–48 dienas. Tyrimų rezultatai parodė, kad STF gavusių viščiukų mikroendoekologijos bei imunofiziologijos rodikliai pagerejo ir antibiotikų jie gavo 60% mažiau negu kontroliniai. Bandomųjų viščiukų žarnyno turinyje, palyginti su kontroliniais viščiukais, gavusiais tik antibiotikų, vyravo laktobakterijos, enterokokai, jų kraujyje rasta daugiau gliukozės, laktato, piruvato, baltymų, IgM, IgY, todėl viščiukų išgyvenimo ir kūno masės priaugimo rodikliai padidėjo atitinkamai 1,2–3,5 ir 2–13%. Salmonelliozių infekcijos ir chemoterapinių disbakteriozių metu pastarieji rodikliai buvo artimi kontrolinės grupės viščiukų, gavusių tik antibiotikų, rodikliams. Taigi Lietuvoje pagamintas eubiotikas STF, pasižymintis probiotinėmis bei terapinėmis savybėmis, gali būti naudojamas kaip alternatyvi gydymo priemonė chemoterapijai, t. y. viščiukų virškinamojo trakto ligų prevencijai bei nespecifiniam organizmo atsparumui didinti pramoninėje paukštininkystėje.

Raktažodžiai: antibiotikai, probiotikai-eubiotikai, *Enterococcus faecium*, viščiukai, mikroflora