

Effect of Pro biotic Supplementation "Vetlactoflorum" on the Biological Value of Broiler Meats

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Abstract

This study evaluates the supplementation of broiler chickens probiotic "Vetlactoflorum- M" (diluted in milk), "Vetlactoflorum-C" (diluted in whey) on the broiler chickens meat and biological value. One hundred and fifty day-old "Ross-308" broilers are used (n=150), the first group without probiotic and 2 groups are supplemented with probiotics in the water. There are nine treatments with 4 replicates and 3 birds per replicate. The results show that there is improving biological value and safety of broiler meat. Also there is an improvement in the acid value of fat, and the reaction (pH) is normal. It is concluded that probiotics "Vetlactoflorum-M" and "Vetlactoflorum-C" are recommended for using on poultry farms of Belarus.

Key Words : Pro biotic Supplementation , Biological Value , Broiler Meats

Introduction

Poultry meat is a food which has been accepted worldwide throughout the ages. Poultry meat is a highly digestible, tasty and low-calorie food, often recommended by nutritionists over other meats. There is currently a world trend to reduce the use of antibiotics in animal food due to the contamination of meat products with antibiotic residues (Menten, 2001), as well as the concern that some therapeutic treatments for human diseases might be jeopardized due to the appearance of resistant bacteria (Dale, 1992). Recently, attempts for substituting these antibiotics by probiotics have been studied. Results of studies found that probiotics are used to stimulate the general resistance of the body, improve the growth and productivity of poultry. Probiotics are used for the prevention and treatment of diseases of the gastro - intestinal tract of chickens caused by

opportunistic-pathogenic microorganisms. One of the presumed mechanisms of the inhibitory effect of probiotics on pathogens of digestive tract is the competition for the intestinal mucosa receptors (Glaskovich *et al.*,2012; Evshel *et al.*,2012; Ryzhik *et al.*,2012a).

In the affectivity, they are not less than some antibiotics and chemotherapeutic agents, it does not have a detrimental effect on the normal microflora of the digestive tract, not contaminate poultry products and the environment, this means they are friend of environment. The use of probiotics in the diet of chickens to prophylactic from salmonellosis, colibacillosis and campylobacteriosis without antibiotics (Popkov *et al.*,2005; Panin, 2002; Ovchinnikov *et al.*,2008; Tohti,2009).

Probiotics, Unlike antibiotics which can negatively affect the bacterial balance in the digestive system by killing healthy bacteria, a quality probiotic can facilitate the body's flora and prevent the production of harmful bacteria. Due to the import program for the Republic of Belarus is an important use of safety products. Limited liability company "Microbiotic" Vitebsk region made probiotic preparation "Vetlactoflorum". However, given the preparation has not been studied previously in the broiler chickens. We are the first in Belarus began the study of the preparation, which is approved by the result of scientific and technical papers (Glaskovich *et al.*, 2012; Evshel *et al.*, 2012; Ryzhik *et al.*, 2012a; Ryzhik *et al.*, 2012b).

The use of probiotics for meat and carcass quality improvement has been questioned and many unclear results have been shown. Some authors reported advantages of probiotic administration (Vargas *et al.*, 2002) whereas others did not observe improvement when probiotics are used. (Quadros *et al.*, 2001). Hence, purpose of study to develop a scientific basis and method of increasing the productivity of poultry by stimulating the natural resistance of biologically active probiotic supplements "Vetlactoflorum-M" (in milk), "Vetlactoflorum-C" (in whey) for growing broiler chickens. The aim of this study is:

1. To evaluate the use of probiotics dietary supplements "Vetlactoflorum-M" (in milk) and "Vetlactoflorum" (in whey) on productivity, safety of broiler

chickens, the cost of feed per 1 kg in the effective dose of the preparation for the entire period of rearing chickens in scientific laboratory experiment.

2. Determine the comparative assessment of bioavailability and safety of poultry meat supplementing probiotic "Vetlactoflorum -M" (in milk), "Vetlactoflorum -C" (in whey) for growing broiler chickens.

Materials and Methods

Scientific laboratory experiment is conducted in a Clinic Epizootology Department, the Department of Microbiology and Virology, Veterinary and Sanitary Inspection and Scientific Research Institute of Veterinary Medicine and Biotechnology- Vitebsk State Academy of Veterinary Medicine.

Laboratory tests have been conducted to evaluate the impact of supplement probiotic "Vetlactoflorum" for natural resistance, metabolism, and growth rate (average daily gain, average body weight), biosafety, economics (cost of feed per 1 kg increase), bacteriological analysis of gastrointestinal tract, including the biological value and good quality of broiler meat which administered "Vetlactoflorum" during the period of their growth.

Vetlactoflorum-liquid preparation of live probiotic acidophilus bacteria strain *Lactobacillus acidophylus* EP 317/402 "Narine" containing 1 cm³ of not less than 10⁷ colony forming units of Lactobacillus. "Vetlactoflorum-M" (diluted in

milk), "Vetlactoflorum-C" (diluted in whey).

For laboratory studies, have been used 150 broiler chicks breed "Ross-308", these chicks are divided into three experimental groups of 50 broiler chickens each, acquired by "Vitebsk broiler chickens farm". The broiler chickens are reared under same environmental conditions, they are kept in thermo-neutral hall (from day one old 33°C until final 19°C). In closed hall thermo aggregate is installed and experimental conditions with defined temperature and humidity are monitored by thermostat.

In the one day-old chicks are sorted by gender on 25 chicks males and females in each group. The feeding period lasted in 42 days. Feed and water are provided on an *ad libitum* basis. Control group (group No. 1) received only standard feed. Experimental broiler chickens (group No.2) receives a probiotic preparation "Vetlactoflorum-M" (in milk) and experimental broiler chickens (group No.3) receives a "Vetlactoflorum-C" (in whey). Probiotic supplemented with drinking water is in all 2 treatment groups at the same time to the basic diet daily in optimal doses as follows:

- At a dose of 0.1 ml / bird / daily - from the 1st to the 27th day.
- At a dose of 0.2 ml / bird / daily - from the 28th to the 42th day before the end of the rearing period.

Chickens are healthy and their condition is a good at the commencement of the experiment.

In stage of growing chicks (control and experimental groups) observed their clinical condition, causes a disposal gain of live weight (weekly by weighing), meat yield and feed consumption per unit of production. At the end of laboratory experiments analyzed the quality of the produce. To aims of study the effect on the good quality of the meat of broiler chickens is applied macroscopically and in laboratory study of 30 carcasses (20 experimental and 10 control) broiler chickens, slaughtered.

Examine of good quality of broiler chickens meat performed according to GOST 7702.0-74 - 7702.2-74 "Poultry Meat. Methods of analysis". The study of the biological value of meat guided GOST 7702.0-74 "Poultry Meat. Sampling methods. Organoleptic quality assessment methods", GOST 7702.1-74 "Poultry Meat. Methods of chemical and microscopic analysis of freshness of meat", GOST 7702.2-74 "Poultry Meat. Bacteriological Methods of analysis" and "Guidelines for toxico-biological evaluation of meat and meat products and milk with using *Tetrahymena pyriformis*" (1997).

Meat pH levels are determined using a digital pH meter (Testo). The electrode is directly introduced into the breast meat. pH measurements are also performed 5 hours after slaughter in the chilled carcasses at the laboratory.

All results are analyzed by Excel programme for study variation statistics, based on the significance ($P < 0.05$).

Results and Discussion

From the data obtained by the study of the intensity of growth that broiler chickens 2nd experimental group (probiotic "Vetlactoflorum-M") in all major indicators in all periods of growth showed the best results of productivity, have a higher intensity of growth compared to control birds (don't receiving probiotic) and birds of group 3 (probiotic "Vetlactoflorum-C"). So, in 21 days (middle rearing period), the average body weight in the group receiving "Vetlactoflorum-M", is (820.8 ± 13.27) gram and higher than that in the 1st control group by 7.4% (763.9 ± 10.30) gram and the third experimental group by 3.4% (796.4 ± 14.75) gram, where probiotic "Vetlactoflorum-C". Also, average daily growth rates of broiler 2nd experimental group (probiotic "Vetlactoflorum-M") are (37.2) gram and are 8.1% better than that of broiler 1st control group (34.4) gram and by 7.3% greater than that of broiler third experimental group (36.0) gram, probiotic "Vetlactoflorum-C". The average live weight of broiler third experimental group ("Vetlactoflorum-C") outperformed counterparts on 1st control group by 4.3%, but it is slightly lower than the productivity of broiler chickens 2nd experimental group. Average daily gain of experimental chickens third group is also higher than in broiler chickens of the 1st control group by 4.7%. Dead bird in 1, 2 and 3 groups is respectively 3, 1 and 1 broiler chicks.

By the end of the rearing period of broiler chickens (42 days)

production rates also remained high in 2nd experimental group ("Vetlactoflorum-M"). The average live weight is (2363.7 ± 37.22) gram and 13.4% higher than that of the 1st control group and by 4.3% indicators third experimental group ("Vetlactoflorum-C"). Weight at third group is (2275.6 ± 30.55) gram (109.1% of control) in the control group (2085.1 ± 35.00) gram average increase in broiler chickens 2nd experimental group ("Vetlactoflorum-M") is 55.3 gram and superior performance of the 1st control group by 13.6% and rates third test group by 4.4%. In the third experimental group ("Vetlactoflorum-C"), average daily growth rate 53.2 gram (109.2% of control) in the control group - 48.7 gram. (This is showed in table 1). Increase of weight may be because of probiotic supplementations lead to increase digestible enzymes. *Lactobacillus* spp. have been shown to produce digestive enzymes in vitro and the enzymes may enrich the concentration of intestinal digestive enzymes). Jin *et al.* (1996) reported that all 12 *Lactobacillus* spp. isolated from chicken's intestine are found to secret amylase, protease, and lipase, either extracellularly or intracellularly, or both extracellularly and intracellularly. These result agreed with some other result where probiotics fed chickens had more weight than other groups (Noh,1997; Mohan *et al.*, 1996; Zulkifli *et al.*, 2000; Lan *et al.*, 2003).

Broiler chickens supplemented probiotic with the drinking water showed higher body weight than

control group. According to Strus *et al.* (2001) lactic acid bacteria are evaluated as beneficial bacteria by

their product of acids (lactic acid), bacteriocin-like substances or bacteriocins.

Table 1-Average body weight (gram) and average daily growth (gram) in 21, 42 days

Indicator	The control group №.1*	Experimental group №.2**	Experimental group №.3***
21 days old			
Average body weight (gram)	763.9±10.30	820.8±13.27	796.4±14.75
Average daily growth (gram)	34.4	37.2	36.0
42 days old			
Average body weight (gram)	2085.1±35.00	2363.7±37.22	2275.6±30.55
Average daily growth (gram)	48.7	55.3	53.2

*Control group (don't received probiotic).

**Experimental group No.2 (received Vetlactoflorum-M).

***Experimental group No.3 (received Vetlactoflorum-C).

During the first period of rearing (first week of starter period) one bird died from experimental groups and 3 chicks of the control group. In the end of the experimental period (42 days) **biosafety ratio** in the experimental group is 98.0% , that means in the normal. In the 1st group (control group) biosafety ratio is only 92.0%. biosafety ratio of chickens in the 2nd and 3rd groups during use of probiotics "Vetlactoflorum-M" and "Vetlactoflorum-C" by 6.5% is lower when compared with the broiler chickens and the control group is 106.5%. Decrease of mortality in experimental probiotic supplementation group return to low infection because of its effect on gastrointestinal functions. Where amongst the most promising targets for functional foods are the gastrointestinal functions, including

those that control transit time, bowel habits, and mucosal motility as well as those that modulate epithelial cell proliferation. Promising targets are also gastrointestinal functions that are associated with a balance colonic microflora, that are associated with control of nutrient bioavailability (ions in particular), that modify gastrointestinal immune activity, or that are mediated by the endocrine activity of the gastrointestinal system. Finally, some systemic functions such as lipid homeostasis that are indirectly influenced by nutrient digestion or fermentation represent promising targets (Clydesdale, 1997; Roberfroid, 1996).

Feed consumption per 1 kg of body weight for the entire period of rearing in broiler chickens 2nd **experimental** group ("Vetlactoflorum-M") is 1.83 kg and

are 9.9% lower than that of broiler 1st the control group (2.03 kg) and 6.9 % lower than that of broiler 3rd experimental group (1.97 kg). Feed consumption per unit of weight gain in broilers 3rd treatment group decreased by 3.0 % compared with the control.

At the end of the laboratory experiment(42 days), the remaining broiler chickens are slaughtered for study the effects of probiotics "Vetlactoflorum-M" and "Vetlactoflorum-C" on the quality of meat and safety of poultry meat.

The sensory analysis of breast meat is evaluated 5 hours after slaughter. Sensory evaluation of products of slaughter is one of the most important criteria for deciding on the suitability of meat for human consumption.

In the experimental and control groups, for carcasses after maturation (24 hours after slaughter) are well-drained of blood, had a dry surface with a whitish-yellow color with a pink tinge. The mucous membrane of the mouth is a brilliant and slightly moistened. Muscle tissue is well developed, rounded shape of the breast, well developed chest muscles, thigh and drumstick. Deposition of subcutaneous fat in the lower abdomen. The keel of the sternum did not stand out, especially in groups where asked probiotics "Vetlactoflorum-M" and

"Vetlactoflorum-C". The surface of the muscle slightly moist, but not sticky. The consistency of thick, formed by pressing a finger pit quickly leveled. The smell is a specific, peculiar fresh poultry meat. Subcutaneous and internal fat pale yellow.

Tendons are elastic, dense, smooth surface of the joints, shiny. Beak glossy, convex eyeball, cornea shiny. Carrying out the test by cooking broth in all cases is a clear and good odour.

Biological value and safety is composed of nutrition, safety, organoleptic properties and biological activity of the product, in other words, it describes the nutritional properties, taste and quality (Table 2).

As seen from the data in Table 2, the indicators of the biological value of meat control and experimental groups had no significant differences. Thus, the use of probiotics "Vetlactoflorum-M" and "Vetlactoflorum-C" does not reduce the biological value of poultry meat and this may be because of Some of *Lactobacillus* species, having at the same time the antimicrobial and physiologically effective antioxidative properties and expressing health-promoting characteristics if consumed (Mikelsaar and Zilmer,2009).

Table 2 - Assessment of broiler meat in the diet with the supplementation of probiotics "Vetlactoflorum-M" and "C Vetlactoflorum», (M + m)

Indicators	The control group № 1*	Experimental group № 2**	Experimental group № 3***
Physical and chemical characteristics of meat and fat broiler chickens			
The reaction of ammonia and ammonium	neg.	neg.	neg.
Reaction to the peroxidase	pos.	pos.	pos.
Acid value of fat, mg KOH	0,97±0,02	0,82±0,03	0,85±0,04
Peroxide value of fat,% iodine	0,006±0,002	0,007±0,001	0,007±0,002
PH	7,92±0,07	5,98±0,03	5,87±0,05
Biological value and safety of poultry			
The relative biological value,%	100	102,3±0,3	101,4±0,2
Toxicity, pathological forms of cell%	0,3±0,03	0,1±0,02	0,1±0,06

*Control group №.1 (don't received probiotic).

**Experimental group №.2 (received Vetlactoflorum-M).

***Experimental group №.3 (received Vetlactoflorum-C).

Physical and chemical characteristics of meat. The results of veterinary and sanitary evaluation of experiment for broiler chickens meats are shown in Table 1. Reaction to the peroxidase in group of experiment in all cases is positive, this means the enzyme remained active. The acid value of the fat is normal (less than 1 mg KOH), and in the 2nd experimental group compared with the control group increased by 1.2%. Peroxide content of fat also did not exceed the permissible levels and at the level between 0.007% iodine (at significant level 0.01). Thus, the use of probiotics has no negative influence on the process of fat metabolism and according to these indicators, the meat is good quality. Reaction (pH) of meat varied within limits of (7.92- 5.98). In the experiment, it is found that the use of probiotics "Vetlactoflorum-M" and "Vetlactoflorum-C", the pH in the 2nd experimental group is 5.98,

which more closely approximates the normal.

According to Pearson (1994), biochemical processes, such as pH changes, should occur so that the animal muscle is converted into meat. pH values in the muscle of live animals is approximately 7.4. And according to Sams & Mills (1993), at the end of the post-mortem process, the normal pH range lies between 5.6 and 5.8 or 5.78 to 5.86, respectively. Therefore, the data of the present study are within the values reported in the literature independent of the use of probiotics and/or prebiotics.

Biosafety studied using a test object ciliates *Tetrahymena pyriformis*. The toxicity of the experimental samples of the product are determined by the presence of the dead ciliates, change their form, the movement and the presence of unusual inclusions in cells protozoan *Tetrahymena pyriformis* (normal percentage of pathological forms of cell ciliates from 0.1 to 1%). From the data in

Table 1 show that no increase of dead cells and inhibited the growth of ciliates in all samples meat of broiler chickens is administered in drinking water, probiotics "Vetlactoflorum-M" and "Vetlactoflorum-C". This indicates that the use of probiotics not impairs the biological value and product quality, and the meat is not toxic to the test object ciliates *Tetrahymena pyriformis*.

Conclusion

1. Research in the laboratory has found that the use of dietary probiotic supplements in an optimal dose of 0.1-0.2 ml/bird in drinking

water daily until the end of the rearing period allows increasing the efficiency and safety of broiler chickens.

2. Pathogens are not isolated from meat of broiler chickens, which are supplemented probiotics "Vetlactoflorum-M" and "C Vetlactoflorum", Also there is an improvement in the acid value of fat, and the reaction (pH) is normal. Based on the above recommended to supplement of probiotics "Vetlactoflorum-M" and "C Vetlactoflorum" for broiler chickens in poultry farms of Republic of Belarus.

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تأثير اعطاء المعزز الحيوي "Vetlactoflorum" على القيمة الحيوية في لحوم فروج اللحم

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الخلاصة

جرت هذه الدراسة لتقييم استخدام المعزز الحيوي "Vetlactoflorum-M" المذاب في الحليب و "Vetlactoflorum-C" المذاب في مصل الحليب (شرش الحليب) في دجاج اللحم وتأثيره على اللحوم والقيمة البيولوجية. استخدم مائة وخمسين طير بعمر يوم واحد من سلالة "روس-308". المجموعة الأولى لم تعطى المعزز الحيوي (مجموعة سيطرة) والمجموعات الثانية والثالثة اعطيت المعزز الحيوي في ماء الشرب. أظهرت النتائج تحسن كفاءة و إنتاجية دجاج اللحم، وقلة في الهلاكات ، وتحسن التوافر الحيوي وسلامة اللحوم. اوصت الدراسة باستخدام المعززات الحيوية "Vetlactoflorum-M" و "Vetlactoflorum-C" في حقول الدواجن في جمهورية روسيا البيضاء.

الكلمات المفتاحية : المعزز الحيوي ، القيمة الحيوية ، فروج اللحم .