INFLUENCE OF PROBIOTIC FEED ADDITIVE ON QUANTITATIVE CHANGES OF BLOOD PROTEINS IN CHICKEN

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SUMMARY

The investigations were carried out in 2003–2004 at the Research Laboratory of Biological Diversity and Technologies of Vilnius Pedagogical University, and on the poultry farm „AB Vilniaus paukštynas“. The subjects of the research – Ross chicken broilers – were assigned into two groups and fed dry not granulated commercial feed having the same composition and nutritional value. Probiotic feed additive Yeasture was included into the feed (dose 1kg/t) for group 2. This additive was included into the premixes for the prepared feed for the chickens from day 0 to 21 days of age.

The results of the investigation showed that under the influence of probiotic feed additive Yeasture, some biochemical parameters of blood of chicken broilers had changed. The total content of nucleic acids in the blood of cockerels and pullets had increased by, respectively, 37.79% (P < 0.05) and 25.86% (P < 0.01) at the age of 21 days, while at the age of 42 days, the corresponding figures were 6.65 and 6.04% compared with the control group. The total content of protein in the blood serum was also higher at the age of 21 and 42 days by, respectively, 12.91 and 9.37% for cockerels and 9.37 and 3.29% for pullets. The increase in the content of albumin by 7.2% was also observed. The proportions of different fractions of globulins were varying within the range of statistical significance.

Keywords: chicken broilers, probiotic feed additive, total amount of protein and nucleic acids in blood, albumins, fractions of globulins

INTRODUCTION

Performance and health status of broilers depend on several factors: genetical properties, conditions on the farm, but especially on the quality of feed and feed additives. The feed has to remain healthy for both a bird and a man, be safe to the environment. The concern about the human health and environment had led to more careful use or even ban of most in-feed antibiotics. Only three antibiotic feed additives are still
allowed in the European Union (Salinomycin, Flavophospholipol and Avilamycin) but they will also be banned from 2006. This urges to look for alternative solutions that would be safe for the consumer [13, 16].

The use of feed additives has to be based on the knowledge of the properties of the digestive tract of a bird. The microflora of the digestive tract of a newly hatched chicken is not formed, and it takes 6–7 weeks until it is fully established [7]. It is essential that useful bacteria should colonize guts of the growing bird. Large population of microorganisms is persisting in the intestinal tract of a bird totalling up to \(10^{11}/g\) [2]. These colonies of metabolically active microorganisms have big influence on the health status of birds. Intestinal microflora is influencing digestive process, absorption of nutrients, synthesizing some vitamins and enzymes. However, these microflora populations are sensitive to various change of the surrounding media – some qualities of feed, presence of inhibitors of digestion, changes in immunity can lead to increasing prevalence of the harmful bacteria in the intestines, causing various diseases and worsening growth of birds [12]. The use of feed antibiotics can decrease numbers of populations of harmful microflora and improve growth parameters of the organism. That is why various antibiotic growth promoters were constantly used in the combined feed recipes [1]. Most of the synthetic substances used were really stimulating the growth of birds, but also remaining in their organism as unwanted residues. This contamination of food could lead to the sensitivity reactions in some humans as well as cause problems of antibiotic resistance [9]. Some natural biologically active substances were found to be effective in establishing and supporting intestinal microflora in birds, stimulating growth of birds and keeping them healthy and at the same time not having any negative influence on the consumer of poultry products [5].

Many probiotic feed additives are used in poultry industry with this purpose. These are microbial preparations developed following the normal microflora present in the digestive tract of birds [11]. Probiotics increase the amount of useful bacteria in the intestines of birds and exclude populations of pathogenic microorganisms [3, 6]. Yeast cultures, enzymes and live bacteria are three most important growth promoters in the contents of probiotics. Yeast culture can improve digestibility of nutrients and absorption of mineral components in the organism of a bird. Live yeast can grow in the anaerobic environment, using or regulating metabolites produced by other microbes, change the pH or neutralize gastric juice preventing from acidosis. Yeasts are rich in enzymes (glucanase, amylase, lipase and protease), amino acids, complex of vitamin B. Enzymes facilitate digestion of hardly digestible or even non digestible components of feed, cellulose and improve effectiveness of feeding. Live useful bacteria such as Lactobacillus acidophilus, Lactobacillus casei, Streptococcus faecium and Bacillus subtilis maintain the beneficial microflora balance and good health of the intestinal tract. Live bacteria are the new generation of growth promoters in poultry production having big advantages in comparison with feed antibiotics – not causing resistance or residues in products [10, 16]. Probiotics are ecological and can be used as feed additives starting from the first day of life and throughout the rest of different growing periods of chicken [8, 15]. One of these probiotic feed additives is Yeasture (produced by Cenzone Inc., USA). This probiotic is containing three natural “co-workers” – yeast cultures, enzymes and useful bacteria that can prevent negative changes in the digestive tract.
The amount of nucleoacids in blood is partly reflecting the intensity of protein metabolism in the organism of chickens. The biological role of nucleoacids is their participation in the synthesis of proteins, they are necessary in the synthesis of molecules of proteins. The results of our study showed that in the experimental group the total amount of nucleoacids in the blood of male and female chickens had increased accordingly 37.79 (P<0.05) and 25.86% (P<0.01) at 21 days of age and 6.65 and 6.04% at 42 days of age in comparison with the control group (Table 1). This increased amount of nucleoacids correlates with the higher amount of proteins in the blood of chickens and shows that in general the biosynthesis of proteins in the organism of birds became more intensive. This was also confirmed by the other biochemical parameters of blood monitored during the trial.

The results of the study also showed that in the blood serum of experimental chickens of the total amount of proteins had increased. The total amount of proteins in the blood of male and female chickens of the experimental group at 21 days of age had
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increased accordingly 12.91% and 1.98% in comparison with the control group. The same tendency was observed at 42 days of age where the total amount of proteins in the blood of male and female chickens of the experimental group had increased accordingly 9.37 and 3.29% in comparison with the control group (Table 2). The changes in total amount of proteins also reflect more intensive metabolism of proteins in the organism of birds.

Another important indicator of physiological status is the proportion of different proteins in the blood. Blood proteins are transporting products of metabolism, hormones, fatty acids, microelements and other substances [4]. The results of our study showed that amount of albumin in the blood of male and female chickens of the experimental group was accordingly higher 4.3 and 10.1% in comparison with the control group.

Three main α, β and γ fractions of globulins can be analysed in the blood proteins using electrophoresis. Globulins of α and β fractions are carriers of various substances, participate in the reactions of blood clotting and the γ fraction globulins participate in the immune reactions and are particularly important for the natural resistance of organism [4]. The results of our study showed that the proportions of different fractions of globulins were varying to a great extent. The total amount of globulins in the serum of broilers of the experimental group at the age of 42 days was lower in comparison with the control group. In our opinion this was caused by the decrease in the amounts of α and β fraction globulins in comparison with the control group. In contrast to that, the levels of γ–globulins in the serum of male and female chickens of the experimental group were found to be higher accordingly 1.9 and 5.4% in comparison with the control group (Table 3).

In conclusion, the results of our study indicated that components of the probiotic

<p>| Table 1. The total amount of nucleic acids in the blood of chicken broilers, mg/ % |</p>
<table>
<thead>
<tr>
<th>Group</th>
<th>Feeding characteristics</th>
<th>Age of 21 days</th>
<th>Age of 42 days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male chicken</td>
<td>Female chicken</td>
</tr>
<tr>
<td>1</td>
<td>Standard feed – Control</td>
<td>605.12±7.489</td>
<td>691.18±11.500</td>
</tr>
<tr>
<td>2</td>
<td>Standard feed + Yeasture</td>
<td>833.80±34.810*</td>
<td>869.94±13.757**</td>
</tr>
</tbody>
</table>

Note: The difference between the test group and the control group is statistically reliable: *P<0.05; **P<0.01

<p>| Table 2. The total amount of protein the blood serum of chicken broilers, g/l |</p>
<table>
<thead>
<tr>
<th>Group</th>
<th>Feeding characteristics</th>
<th>Age of 21 days</th>
<th>Age of 42 days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male chicken</td>
<td>Female chicken</td>
</tr>
<tr>
<td>1</td>
<td>Standard feed – Control</td>
<td>30.20±2.150</td>
<td>35.30±0.900</td>
</tr>
<tr>
<td>2</td>
<td>Standard feed + Yeasture</td>
<td>34.10±0.480</td>
<td>36.00±1.180</td>
</tr>
</tbody>
</table>
feed additive Yeasture (yeast cultures, enzymes and live bacteria) helped to maintain the microflora balance of the intestinal tract of birds, what resulted in more efficient use of nutrients from the feed, more intensive processes of protein metabolism, and subsequently in better health of the birds.

**CONCLUSIONS**

1. It was assessed that under the influence of the probiotic feed additive Yeasture, the total amount of nucleic acids in the blood of chicken broilers at the age of 21 day in the experimental group was, respectively, higher in males on 37.79% (P<0.05), in females on 25.86% (P<0.01), at the age of 42 days – respectively on 6.65% and 6.04% (results within the range of statistical significance) in comparison with the control group.

2. Total amount of proteins in serum of broilers of the experimental group at the age of 21 and 42 days was respectively higher on average by 11.14% (males) and 2.63% (females) in comparison with the control group.

3. Amount of albumins in the blood of broilers of the trial group at 42 days of age was also higher on average by 7.2%, proportions of $\alpha$, $\beta$, $\gamma$ globulins were varying within the range of statistical significance.

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**PROBIOTINIO PREPARATO ĮTAKA VIŠČIUKŲ KRAUJO BALTYMŲ POKYČIAMS**

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Santrauka

Tyrimai buvo atlikti 2003–2004 metais Vilniaus pedagoginio universiteto Biologinės įvairovės ir technologijų laboratorijoje ir AB „Vilniaus paukštynas“. Tyrimų objektu buvo pasirinkti Rosso keturių linijų derinio viščiukai brolieriai. Tirta probiotinio preparato Yeasture (gamintojas „Cenzo-¹ Corresponding author. Tel. +370 612 14102, e-mail: bamlab@vpu.lt

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ne“, JAV) panaudojimo galimybė viščiukų broilerių lesaluose ir jo įtaka viščiukų kraujo baltymų pokyčiams. Nustatyta, kad 21 ir 42 dienų viščiukų amžiui dėl šio probiotinio preparato įtakos padidėjo bendras nukleorūgščių kiekis gaidžiukų kraujyje 37,79% (P<0,05), vištaičių – 25,86% (P<0,01), 42 dienų atitinkamai 6,65% ir 6,04%, palyginus su kontroline grupe. Bendrųjų baltymų kiekis 21 ir 42 dienų viščiukų krauoje serume taip pat buvo didesnis: atitinkamai gaidžiukų 12,91% ir 9,37%, o vištaičių – 9,37% ir 3,29%, palyginus su kontroline grupe. Pastebimas albuminų kiekio padidėjimas viščiukų kraujyje, vidutiniškai 7,2%, palyginus su kontroline grupe. Atskirų globulinų frakcijų santykis buvo statistikai patikimose ribose.

Raktažodžiai: viščiukai broileriai, probiotinis preparatas, kraujo bendrųjų baltymų kiekis, nukleorūgščių kiekis, albuminai, globulinų frakcijos.

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ВЛИЯНИЕ КОРМОВОЙ ДОБАВКИ ПРОБИОТИКА НА БЕЛКОВОЙ ОБМЕН В КРОВИ У ЦЫПЛЯТ-БРОЙЛЕРОВ

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Резюме

Исследования проведены в 2003–2004 г. в Лаборатории биологической разновидности и технологий Вильнюсского педагогического университета и на Вильнюсской птицефабрике. Объектом исследования были цыплята-бройлеры кросса Росс. В опыте были скомплектованы 2 группы цыплят–бройлеров, которых кормили сухим негранулированным стандартным кормом одинакового состава и питательной ценности. Группе № 2 в корма дополнительно вводили 1 кг/тонну пробиотика Йисчер (Yeasture). Эта добавка вводилась в кормовые премиксы для цыплят в возрасте от 0 до 21-го дня жизни.

Результаты исследований показали, что под влиянием добавки пробиотика Йисчер (Yeasture) изменились биохимические показатели крови цыплят. В крови цыплят получавших добавку Йисчер (Yeasture) по сравнению с контрольной группой было установлено повышение общего количества нуклеокислот; общего количества белков и альбуминов. Пропорции различных фракций глобулинов варьировали в пределах статистической достоверности.

Ключевые слова: цыплята-бройлеры, пробиотики, белки и нуклеокислоты.

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