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ALTERNATIVE METHODS OF PREVENTION OF INFECTIOUS POULTRY DISEASES

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The article presents the results of analytical work of data from scientific publications, reports of the United Nations Food and Agriculture Organization (FAO), the European Food Safety Authority (ESFA) regarding the effectiveness of alternative methods of prevention of infectious poultry diseases. One of the biggest current problems in the world is the acquired resistance of microorganisms to antibacterial drugs, which in turn causes significant economic losses due to the low effectiveness of therapeutic measures. In connection with the general tendency to abandon the use of antibiotics, the use of new methods of controlling poultry bacteriosis is becoming more and more relevant. The search for an alternative to antibiotics activates the use of effective, natural, safe and cost-effective means of protecting the macroorganism from pathogens. The use of ecologically safe preparations is carried out according to the criteria of effective protection of the poultry organism from pathogenic and opportunistic pathogens, the naturalness and safety of the preparation, obtaining ecologically safe livestock products free from residues of toxic substances, antibacterial preparations and the economic efficiency of the measures taken.

Alternative methods of prevention of infectious diseases of poultry are implemented on the basis of the use of environmentally safe drugs (probiotics, prebiotics, eubiotics). Probiotic cultures of microorganisms exhibit antagonistic properties relative to certain strains of pathogenic and opportunistic microorganisms, capable of producing substances that stimulate the growth of beneficial intestinal microorganisms, improve feed conversion and increase performance indicators. Prebiotics create conditions for the reproduction of beneficial intestinal microorganisms and adsorb pathogens of the intestinal microbiome. The use of enzymes, probiotics, prebiotics, synbiotics and phytobiotics in the process of growing poultry has shown positive results due to increasing their productivity and obtaining high-quality and safe poultry products. These drugs are effective means of prevention and treatment of diseases of infectious etiology through stimulation of non-specific immunity, correction of dysbacteriosis during stress, and also as an alternative to antibiotics.

Key words: *poultry, probiotics, prebiotics, prevention, infection.*

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Introduction. Poultry farming is one of the most profitable areas and a competitive type of agribusiness. Commercial poultry farming is a vertically integrated industry characterized by an intensive production process. Farms breed high-yielding poultry mainly of foreign breeding, which is aimed at obtaining maximum productivity and, accordingly, ensuring the profitability of commercial poultry farming (Dittoe et al., 2020; Hedayat et al., 2022; Mehmood et al., 2023). However, this creates risks of reducing the adaptation capabilities of the poultry organism to environmental and technological factors. To increase the productivity of poultry based on the improvement of feed conversion, feed additives with antibiotics have been widely used, which is currently prohibited by national and international legislation (Penha et al., 2018; Rothrock et al., 2019; Shi et al., 2019; Gadde et al., 2017). It should be noted that the effectiveness of measures to combat and eliminate infectious diseases is based on the use of antibacterial drugs, which creates risks of the spread of resistant strains of bacteria and is becoming an increasingly serious problem today. In addition, poultry products containing residues of antibiotic drugs are dangerous for consumption. Such products of animal origin are a potential cause of allergic reactions in humans and reduce the therapeutic effectiveness of treatment. Since May 2015, Resolution 68 of the World Health Assembly has adopted the Global Action Plan to Combat Antimicrobial Resistance. In Ukraine and in most countries of the world, legislative frameworks have been developed and implemented to limit the use of antimicrobial drugs, which are of critical importance in humane medicine, in veterinary medicine and agriculture. Industrial poultry farming is transitioning to “antibiotic-free” production systems (Wu et al., 2019; Yasmin et al., 2019; Zhou et al., 2022; Poole et al., 2017).

Research materials and methods. Analytical work was carried out on the basis of data analysis of scientific publications, reports of the United Nations Food and Agriculture Organization (FAO), the European Food Safety Authority (ESFA).

Results. In recent years, the trend towards the production of organic products has spread widely in everyday life, and the field of poultry farming does not remain aloof from such trends. Organic poultry farming is based on the implementation of the principles of improving animal welfare. A serious problem for commercial poultry farming is caused by infectious diseases of poultry, among the causative agents of which the role of pathogenic and opportunistic microorganisms is increasing. Therefore, in order to preserve healthy poultry in modern conditions, a set of preventive measures is carried out, based on the use of alternative ecologically safe means. Currently, the popularity of organic poultry production systems, which do not allow the use of antibiotics in their production practices, is increasing (Ricke et al., 2019; FAO/WHO, 2022). However, for these alternative ecological production systems, it is recommended to use feed additives, which are necessary to preserve the health and increase the productivity of poultry (Sokale et al., 2019; Kulkarni et al., 2022; Hai et al., 2021; Buntyn et al., 2016; Gadde et al., 2017).

Despite the fact that a large number of microorganisms are recorded in the gastrointestinal tract of poultry (Dos Santos et al., 2021; Lourenco et al., 2019; Mustafa et al., 2022), most of them are not pathogenic. However, under certain conditions, some strains of pathogens in this population can also be conditionally pathogenic. The authors note the increase in antimicrobial resistance of the isolates *Salmonella enterica ser. Typhimurium* and *E.coli* isolated from the intestines of poultry. These bacteria directly pose risks to human health through the consumption of poultry products (food eggs and meat products) (Spickler et al., 2019; Swaggerty et al., 2019). A significant amount of data on the growth of antibiotic resistance of bacterial pathogens causes considerable concern among specialists in most countries of the world, as it creates risks for human health (Ricke et al., 2019; Ramlucken et al., 2020). Today's challenges form the task of defining new approaches and alternatives to solve this problem (Lourenco et al., 2020; Ricke et al., 2020; Rodríguez-Sojo et al., 2021).

In poultry farming, alternative methods of prevention of infectious diseases of poultry are effectively implemented based on the use of environmentally safe products such as enzymes, organic and inorganic acids, probiotics, prebiotics, synbiotics, eubiotics, multibiotics, extracts of medicinal herbs and essential oils (Cui et al., 2017; El-Saadony et al., 2022). The vast majority of reports in the scientific literature have focused on the use of «probiotics» as an effective antagonistic approach to population control of bacterial pathogens. This practice is widely used in many countries of the world in various poultry farming systems, including free-range poultry systems. Most reports indicate a reduction in poultry morbidity and mortality, an increase in productivity and a guarantee of food safety (FAO/WHO, 2022; Hammershoj et al., 2016; Forte et al., 2018; Li et al., 2018; Shi et al., 2022).

The modern concept of «probiotics» was first developed by I. Mechnikov, who noted. The scientist noted that people living in rural areas in Bulgaria have a higher life expectancy. The researcher associated this fact with the consumption of a large number of fermented milk products in their diet. Mechnikov suggested that there is a certain type of microorganisms in the dairy product that changed the fermentation of bacteria in the intestines (Alonso, et al., 2019). Certain bacteria (probiotic microorganisms) on the basis of which Mechnikov substantiated his theory were identified as Lactobacillus bulgaricus with. These strains of «Bulgarian stick» were subsequently used for the production of the Bulgarian sour milk product «kiselo mleko» (Chen et al., 2020; He et al., 2019; Khan et al., 2019).

Probiotic cultures of microorganisms exhibit antagonistic properties relative to certain strains of pathogenic and opportunistic microorganisms. Also, probiotic cultures have the ability to produce substances that stimulate the growth of other strains of microorganisms (Lokapirnasari et al., 2019; Mortada et al., 2020). The authors note that live probiotic bacterial cultures have a positive effect on the host's body, improving the microbial balance of its intestines (Feye et al., 2020). In scientific publications, it is noted that some of these live probiotic cultures began to be described by the general term «eubiotics», which is related to the Greek word «eubiosis», which means an optimal balance of microbiota in the gastrointestinal tract (El et al., 2021; Tarus et al., 2019; Vase-Khavari et al., 2019). Although probiotics are widely used to improve and maintain human health (Yaşar et al., 2017; Yazhini et al., 2018), probiotic supplements are mainly used in animal husbandry. In agriculture, probiotics are used to increase feed conversion, stimulate growth (Zhou et al., 2020) and reduce the number of pathogens in the gut (Shi et al., 2022; Rashid et al., 2023).

The use of probiotics in poultry farming was considered as an alternative to antibiotics, which actively contributed to the development of beneficial intestinal microflora, suppress the growth of pathogens and thereby improve productivity. A large number of probiotic products are presented on the domestic drug market, which are offered to increase productivity, its health, well-being, and the production of safe and quality poultry products (Ricke et al., 2019; Poole et al., 2017; de Souza et al., 2022). A wide range of microorganisms: fungi and bacteria have been studied experimentally to determine their probiotic properties and effectiveness of use, however, only some of them are used by the pharmaceutical industry for the production of drugs and have reached the industry level of use (Bortoluzzi et al., 2019). According to international requirements for commercial use, it is recommended to use only those probiotic cultures that are included in the «recommended» list in order to reduce regulatory obstacles that arise during commercialization. The mechanism of action of probiotics varies depending on the culture of microorganisms and is divided into certain categories (Aziz et al. 2020; Buntyn et al., 2016). According to the mechanism of action, probiotic microorganisms are divided into groups depending on their ability to produce inhibitory substances: short-chain fatty acids, bacteriocins and other substances (Abbas et al,. 2021; Anonymous et al., 2018). One of the main factors is also the competition of probiotic microorganisms for the adhesion site on the epithelium of the gastrointestinal tract, which prevents the pathogen from physically binding to the epithelial cells (Al-Qazzaz et al., 2016). In addition, stimulation of the host's immune system can play a role in this process. However, taking into account the complexity and multiplicity of the intestinal microbiome of poultry and the various mechanisms of action of probiotics, a callous combinatorial antagonistic effect is created against pathogenic and opportunistic microorganisms.

In the scientific literature, it is noted that probiotic preparations are applied to productive birds with feed or water. Reports indicate a positive effect of the use of probiotics on the assimilation of feed nutrients, intestinal barrier function, antioxidant activity, and immune responses and performance of broilers (Adnan et al., 2023). The effectiveness of the use of probiotics in the diet of poultry often depends on the consumption of feed, which has a constant effect on the mucous, epithelial and vascular barrier of the intestine, affecting its structural and morphological changes. The researchers also note the positive effect of probiotic preparations on the increase in body weight of the bird and the state of health and well-being due to the reduction of morbidity and mortality during certain critical phases of production, such as dietary stress (change of diet, rations rich in concentrates) and stress (e.g., poultry stocking density and other factors) (Neveling et al., 2020).

In the scientific literature, there are reports on the results of the study of the biochemical parameters of the blood serum of birds after the use of probiotic preparations. An increase in serum protein, a decrease in total cholesterol and triglycerides in the blood serum of broilers was registered (Yazhini et al., 2018). There are also data on the reduction of cholesterol and fat content in the white and red muscles of the breast and thighs (Yazhini et al., 2019). Additional studies report higher fatty acid content in broiler meat and higher levels of vitamin E and other nutrients. For example, there are reports of a positive effect on the egg productivity of hens, the number of eggs, the weight of eggs, the increase in shell thickness and its weight, and the intensity of the color of the egg yolk (Al-Qazzaz et al., 2016).

Addition of probiotics to poultry diets under organic farming systems has the potential not only to improve productivity and organoleptic quality of poultry products, but also to reduce environmental pollution by industry waste (pollutants). Probiotics are able to reduce the need for nutrients by ensuring the assimilation of nitrogen and phosphorus that comes from the feed. In this way, the solution to one of the main problems of pollution of the ecosystem with waste is realized and thus the accumulation of phosphorus, potassium and nitrogen in the soil is reduced (Dittoe et al., 2018). In some cases, the use of probiotic supplements reduced the amount of nitrogen in wastewater, which potentially means increased feed conversion and reduced nitrogen requirements in diets, resulting in reduced nitrogen in the environment (Adhikari et al., 2018; Andino et al., 2015).

Some probiotics have also been reported to demonstrate significant immunomodulatory potential. Protection against pathogens, improved digestion and increased biological value of nutrients can be addressed by modulating the immune response (Feye, et al., 2020).

These benefits can be achieved by enhancing the innate and acquired immunity of productive poultry (Swaggerty et al., 2019; Asghar et al., 2016).

There are data on the influence of probiotic cultures on innate immunity by modulating the proliferation of macrophages, heterophils and lymphocytes of type B1. These mechanisms of influence are more rational compared to the stimulation of acquired immunity. However, more studies are needed to confirm such differences (Sokale et al., 2019; He et al., 2019).

In the scientific literature, research on the immunomodulatory effect of probiotic cultures of lactic acid bacteria *Lactobacillus acidophilus, Lactobacillus reuteri,* and *Lactobacillus salivarius* during oral administration is indicated. The ability of *L.reuteri* to modulate the immune system of broiler chicks after immunization of the bird with Newcastle disease virus vaccine and infectious bursal disease virus vaccine at 14 and 21 days of life was demonstrated. While probiotic cultures of *L. acidophilus* did not show immunomodulatory properties (Li et al., 2018). It has been proven that the use of probiotics also has a positive effect on the immune system of poultry through interaction with intestinal epithelial and immune cells. In order to select probiotic strains of microorganisms for the potential use of probiotic preparations, immunomodulatory properties were tested in vitro. Their ability to survive in an acidic environment (pH 2.5) and bile salts (0.1–1.0%) was studied. Subsequently, six strains of laboratory bacteria were selected from the in vitro screening. Three of these strains (*Lactobacillus plantarum PZ01, L. salivarius JM32 and Pediococcus acidilactici JH231*) decreased the levels of lipopolysaccharide-induced TNF-α factor (LITAF), IL-1β, IL-6 and IL-12 and increased serum IL-10 in vivo during Salmonella infection in broiler chickens.

There are also comparative data on the results of the use of 4 genera of microorganisms (*Lactobacillus, Bifidobacterium, Enterococcus* and *Pediococcus*) in the diet of broilers. Broilers received a basal diet of corn and soybeans with and without probiotics added to feed or water. Experimental groups of broilers fed diets with the addition of a probiotic mixture of these microorganisms demonstrated significantly higher specific activity of two glycolytic enzymes associated with intestinal modulation and immune stimulation, α-galactosidase and β-galactosidase, compared to those fed control diets. Summing up, it should be noted that the advantages of using probiotic cultures in the diet of broilers are the modification of the intestinal ecosystem, which often demonstrated very diverse research results. The effect depends on several parameters, namely the strains of microorganisms used, the concentration of probiotics in the feed, the interaction of probiotics with individual components of the diet, the interaction with the gastrointestinal microflora, the age of the bird, the completeness and balance of the rations, as well as the health of the bird (Cui et al., 2017). There is also a report of a comparative assessment of broiler performance indicators with the combined addition of probiotic preparations of bacterial origin based on Enterococcus spp. to the diet. And the prebiotic preparation of Levucell SB 20 yeast origin (lyophilic dried yeast *Saccharomyces cerevisiae* (strain CNCM I-1079). The results of the study confirmed the effectiveness of the use of a combinatorial combination on the basis of higher productivity indicators, better morphological development of the digestive system, yield of meat carcass and meat quality 35-day-old broiler chickens. In the experimental group of birds in which only a prebiotic (lyophilized Saccharomyces cerevisiae yeast) was given together with the diet, a lower mortality rate was recorded before the age of 35 days compared to the control group of birds. Also, a significant increase in the weight of the birds was recorded in aged from 64 to 84 days, compared to the control group of poultry.

We also analyzed literature data on the pathogenetic mechanisms of the antagonistic action of probiotic cultures of microorganisms relative to pathogenic microflora. Literature sources indicate that probiotics have an antibacterial effect against food pathogens *Salmonella spp.* and *Campylobacter spp.* through direct competitive action and indirect exclusion. Experimental studies have established that strains of *Lactococcus lactis, Carnobacterium divergens, Lactobacillus casei* and plantarum, and *Saccharomyces cerevisiae* have been shown to reduce *Campylobacter spp.* In production conditions, the population reduction of *Campylobacter spp.* is justified. in the gastrointestinal tract and their absence in the obtained carcasses after processing.

Fowl typhus, an acute or chronic systemic infection of poultry caused by *Salmonella Gallinarum.* This causes significant economic losses in poultry farming in various countries including Pakistan. The results of experimental studies conducted in Pakistan on the effect of strains of *Limosilactobacillus fermentum* (PC-10 and PC-76) on the competitive exclusion of *S. gallinarum* in the intestines of poultry are presented in the scientific literature. The research was about The purpose of this study was to evaluate the in the intestine of day-old chickens (n=90). were divided equally into six groups. Group 1 was used as a negative control and group 2 was used as a positive control. Poultry in the experimental groups were administered probiotic strains of *Limosilactobacillus fermentum* PC-10, PC-76 from 1–35 days of rearing. The research results showed that on the 35th day in the experimental groups, the level of intestinal colonization by *S. gallinarum* significantly decreased (3.92±0.37 vs. 3.99±0.22 log 10 CFU/g) compared to the positive control group (6 ,88±0.2 log 10 CFU/g) ($P<0.05$). The use of these probiotic strains provided a significant increase in the number of *Lactobacillus spp.* > 2 log10 and a decrease in the number of coliform bacteria (1–2 log10) in the intestines of broilers. In oral groups of birds treated with probiotic strains, a lower mortality rate was recorded compared to the positive control group. In addition, a group of broilers given *Limosilactobacillus fermentum* PC-10 and PC-76 showed higher body weight gain (Adnan et al., 2023). Similar results were obtained with the addition of probiotic strains to broiler diets, which demonstrated an increase in body weight gain and a decrease in coliform proliferation in the intestines of broilers. In addition, the growth rate of lactobacilli increased at the beginning of the first day of use (Smialek et al., 2018; Asghar et al., 2016). However, in the caecum, there was no significant reduction in the population of *Campylobacter spp.* (Smialek et al., 2018; Mortada et al., 2020), suggesting that this probiotic activity occurs mainly in the small intestine of the bird. Broilers orally administered *L.salivarius* showed effective prevention of *C.jejuni* intestinal colonization of broilers. Probiotics are also active against less common foodborne pathogens that affect poultry health and poultry product safety, such as *E. coli, S. aureus, Y. enterocolitica, C. perfringens,* and *L. monocytogenes* (Zhou et al., 2016; Li et al., 2018 ; Ramlucken et al., 2020). Poultry infections caused by *C. perfringens* can lead to morbidity and mortality in chickens (Sokale et al., 2019). Prevention of the development of infection in poultry was successfully achieved thanks to the use of several strains of bacteria: *B. subtilis* and *B. licheniformis*, *E. faecium, L. acidophilus, B. pullicaecorum* (Li et al., 2018; Sokale et al., 2019). Therefore, the population of C.perfringens can be kept at a low level in the gastrointestinal tract by competitive exclusion, which improves overall poultry health and performance.

Aflatoxin, a family of toxins produced by certain microscopic fungi (*A. flavus* and *A. parasiticus*), poses a significant risk to the poultry industry due to direct toxicity, which poses risks of high morbidity and mortality in poultry throughout the rearing cycle. In most cases, the accumulation of aflatoxin in the diet of poultry is difficult to detect. However, the use of probiotics in broiler diets demonstrated a direct anti-aflatoxin effect (Spickler et al., 2019).

Research on the effectiveness of the combined use of prebiotics and probiotics is also given in the scientific literature. The researchers evaluated the effectiveness of using pro- and prebiotic drugs on *S. enteritidis* infected broilers that were raised on free range. The combined addition of probiotics and prebiotics to the diet of an infected experimental group of poultry significantly reduced the level of intestinal colonization by *Salmonella* due to colonization of the intestine by competitive strains of probiotic bacteria (Swaggerty et al., 2019). Other researchers confirm that the addition of probiotics from two probiotic bacteria (spores of *E. faecium* and *B. subtilis*) to the diet of poultry ensured the health of the poultry and improved meat quality indicators, namely, a decrease in the percentage of moisture and an increase in the proportion of protein in the meat were recorded breasts and thighs after 42 days of use (Aziz et al., 2020). However, no influence on the acidity (pH) of white and red meat has been established (Aziz et al., 2020). Also, based on the research of Aziz et al., 2020, we have comparative data on the addition of probiotic preparations of different concentrations to broilers. This ensured the improvement of feed consumption and conversion, contributed to the increase in live weight gain of poultry. Experiments have established that the concentration of probiotic preparation in the diet of broilers of 0.160 g/l was optimal for improving meat quality indicators (Aziz et al., 2020). Overall, based on the results of these studies, it appears that the response to probiotic supplementation in free-range broilers is not inconsistent. Therefore, probiotics may be more effective in broilers that are under stress, perhaps due to exposure to extreme environmental temperatures, disease, overcrowding, which can occur in both conventional and alternative production systems.

We also analyzed the effectiveness of the use of probiotics for poultry under an organic system of maintenance. In recent years, production of organic poultry meat and edible eggs has increased globally, increasing by 23% from 2020 to 2023. Products obtained from an organic farming system have a higher nutritional and nutritional value than eggs from caged chickens. However, rations should meet the energy and crude protein needs of laying hens. This problem is solved by introducing appropriate probiotic and feed additives into the diet (Mehmood et al., 2023).

There is also a report by the authors about the positive effect of prebiotic drugs on the laying of quails. There are reports on the effect on the state of the intestinal microbiome and productivity of quails when using a probiotic culture of Bacillus subtilis in the diet. Addition of probiotics to the diet has been shown to improve egg production and egg weight (Manafi et al., 2016). In addition, the height of the intestinal villi of the intestinal mucosa increased. A decrease in the number of *Salmonella*, *Escherichia coli* and total coliforms in the intestinal microbiome was also recorded (Manafi et al., 2016). There is also published data that probiotics can prevent damage to the reproductive system and potentially increase the productivity of laying hens. The use of probiotics *Bifidobacterium spp.* and *L.casei*, can improve egg production in organic laying hen rearing systems. Administration of probiotics (0.5% *Bifidobacterium spp.* + 0.25% *L. casei*) was administered at intervals of 1, 2, 3, and 4 weeks to 180 laying hens (Lohmann) aged 30 weeks. Addition of probiotics to the diet during the 1st and 2nd weeks showed results indicating lower feed intake and the highest egg mass throughout the application period. The authors confirm that the addition of probiotics as feed additives can also increase the assimilation of feed nutrients by improving the structure of the intestinal mucosa (Hammershoj et al., 2016). It has been proven that the addition of LAB probiotics to the diet improves the structure of the mucous membrane of the gastrointestinal tract and suppresses the growth of pathogenic bacteria. An optimally functioning gastrointestinal tract has a positive effect on the improvement of metabolic processes and assimilation of nutrients necessary for the bird's body (Lokapirnasari et al., 2019). However, this may depend on the type of probiotic. For example, the addition of two different probiotics (*L.acidophilus* and *B.subtilis*) to the diet of laying hens was compared. Poultry rations based on corn-soybean cake (Forte et al., 2016). Subgroups of chickens at 18 weeks, 5 months, and 7 months of age were euthanized, and sections of the duodenum and small intestine were then removed for morphological examination. The contents of the ileum and cecum were examined for the number of *E. coli*, *Enterococci, Staphylococci, Clostridium spp.*, the total number of anaerobes, bifidobacterium and lactobacilli. Morphological changes in the gastrointestinal tract were not recorded, but microbiological differences occurred (Forte et al., 2018; Swaggerty et al., 2019). In general, in the gastrointestinal tract of chickens fed L. acidophilus probiotics, the lowest number of E. coli, staphylococci was recorded, while *L. acidophilus* and *B. subtilis* together reduced the number of *Clostridium spp.* Both probiotics provided an increase in the number of lactobacilli and bifidobacteria. It should be noted that the addition of probiotics affected the concentration of beneficial intestinal microflora (*Bifidobacterium spp.*). Thus, with the use of *L. acidophilus*, a decrease in the concentration of bifidobacteria in the intestines of the bird was recorded, while the addition of *Bacillus spp.* contributed to the increase in the concentration of the mentioned bacteria. These results suggest that there may be some competition between bifidobacteria and lactobacilli in the gut. However, a minimal effect of the studied probiotic preparations on the total number of anaerobes in the intestinal microbiome was established (Sokale et al., 2019). Based on the obtained results, we can conclude that the effectiveness of the use of probiotic preparations is based on a preliminary study of the qualitative and quantitative composition of the intestinal microflora.

Conclusions. The use of enzymes, probiotics, prebiotics, synbiotics and phytobiotics in the process of growing poultry showed positive results due to increasing their productivity and obtaining high-quality and safe poultry products. These drugs are effective means of prevention and treatment of diseases of infectious etiology through stimulation of non-specific immunity, correction of dysbacteriosis during stress, and also as an alternative to antibiotics.

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Альтернативні методи профілактики інфекційних хвороб птиці

У статті наведено результати аналітичної роботи даних наукових публікацій, звітів продовольчої та сільськогосподарської організації ООН (FAO), Європейського управління з безпеки харчових продуктів (ESFA) щодо ефективності застосування альтернативних методів профілактики інфекційних хвороб птиці. Однією з найбільших актуальних проблем світі є набута резистентність мікроорганізмів до антибактеріальних препаратів, що в свою чергу спричиняє значні економічні збитки за рахунок низької ефективності терапевтичних заходів.

У зв’язку із загальною тенденцією відмови від використання антибіотиків все більшої актуальності набуває застосування нових методів контролю бактеріозів птиці. Пошук альтернативи антибіотикам активізує застосування ефективних, натуральних, безпечних та економічно ефективних засобів захисту макроорганізму від патогенних збудників. Застосування екологічно-безпечних препаратів здійснюється за критеріями ефективного захисту організму птиці від патогенних та умовно-патогенних збудників, натуральності і безпечності препарату, отримання екологічно безпечної продукції тваринництва вільної від залишків токсичних речовин, антибактеріальних препаратів та економічної ефективності проведених заходів.

Альтернативні методи профілактики інфекційних хвороб птиці реалізуються на основі застосування екологічно безпечних препаратів (пробіотиків, пребіотиків, еубіотиків). Пробіотичні культури мікроорганізмів проявляють антагоністичні властивості відносно до певних штамів патогенних і умовно-патогенних мікроорганізмів, здатні продукувати речовини, що стимулюють ріст корисних мікроорганізмів кишечника, покращують конверсію корму та підвищують показники продуктивності. Пребіотики створюють умови для розмноження корисних мікроорганізмів кишечника та адсорбують патогени кишкового мікробіому. Застосування ферментів, пробіотиків, пребіотиків, синбіотиків та фітобіотиків в процесі вирощування птиці показали позитивні результати за рахунок підвищення їх продуктивності та отримання якісної і безпечної продукції птахівництва. Дані препарати є ефективними засобами профілактики і лікування захворювань інфекційної етіології через стимуляцію неспецифічного імунітету, корекцію дисбактеріозів при стресах, а також як альтернативу антибіотикам.

Ключові слова: *птиця, пробіотики, пребіотики, профілактика, інфекція.*