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THERAPEUTIC AND PREVENTIVE MEASURES AGAINST EIMERIOSIS IN CHICKENS UNDER THE CONDITIONS OF THE «AITAS» POULTRY FARM JSC, UST-KAMENOGORSK

ANNOTATION

One of the most fast-developing branches of animal husbandry is poultry farming. It is the most science-intensive and dynamic sector of the agro-industrial complex. Agricultural poultry is characterized by rapid reproduction, intensive growth, high productivity, and vitality. The rearing and maintenance of poultry require less manual labor and material costs per unit of production compared to other branches of animal husbandry.

The domestic market demand for poultry meat is about 450–500 thousand tons. Self-sufficiency in poultry meat currently stands at around 50%, although chicken production ranks second after beef production in the country.

In modern poultry farming, along with positive trends, there remain many problems requiring comprehensive solutions. Among them is the spread of parasitic diseases in chickens, which occur in poultry farms of various ownership forms. Research by domestic and foreign scientists has proven that any poultry enterprise practicing floor housing of birds is disadvantaged by parasitic diseases, especially by eimeriosis. Practice shows that eimeriosis is a significant problem in poultry farming, as there is practically no industrial poultry farm free from this invasion. Moreover, when veterinary and sanitary regulations in poultry houses are violated, Eimeria can accumulate in large quantities within a short period.

Therefore, at present, the main urgent problem in poultry farming is chicken eimeriosis. This is primarily due to the active development of industrial poultry farming in the Republic of Kazakhstan. Chicken eimeriosis is widespread. Due to the high susceptibility of young birds, eimeriosis causes enormous economic losses to the poultry industry, consisting not only of decreased productivity but also of high mortality, culling, and additional costs for feed and medication.

Due to insufficiently organized work on the treatment and prevention of chicken eimeriosis at this poultry farm, we had the opportunity to study this problem.

Keywords: *Eimeriosis, chickens, poultry farming, invasion, poultry farm.*

Introduction. Chicken eimeriosis is an acute, subacute, or chronic disease of chicks aged 10 to 80 days caused by sporozoans of the family Eimeriidae. Nine species of Eimeria parasitize chickens. They belong to the order Coccidia, subfamily Eimeriinae, genus Eimeria.

Poultry farms that use floor housing record eimeriosis quite often and with high prevalence and intensity of invasion. It should be remembered that even at modern poultry farms where most birds are

reared in cages, the technology provides for keeping the parent flock on the floor, which also leads to infection with Eimeria [1,2].

Alongside positive trends, modern poultry farming still faces many problems requiring comprehensive solutions. Among them, the issue of biosecurity in industrial poultry production against parasitic enteropathogens such as Eimeria is especially important. It has been established that the prevalence and intensity of invasion under floor housing technology are several times higher than under cage rearing, and the economic loss from chick eimeriosis worldwide amounts to a significant sum annually.

Whereas it was previously believed that nine Eimeria species parasitize young chickens, it is now recognized that chick Eimeria are represented by seven species: Eimeria acervulina; E. brunetti; E. maxima; E. mitis; E. necatrix; E. praecox; E. tenella. Depending on localization, two forms of chick eimeriosis are distinguished: cecal, whose etiological agent is E. tenella, and intestinal, caused by E. acervulina, E. brunetti, E. maxima, E. mitis, E. necatrix, E. praecox [3,4].

If veterinary and sanitary rules are violated, Eimeria can accumulate in the poultry house within a short time. Eimeriosis is also dangerous in association with other diseases, posing a major threat to poultry farming. Even a mild form of eimeriosis, combined with inadequate feeding, viral and bacterial infections, mycotoxins in feed, and other adverse factors, causes significant economic losses.

Infection with Eimeria on farms occurs when chicks ingest sporulated oocysts, whose source is manure contaminated by clinically ill chicks and infected adult birds [5,6].

Materials and methods. The work was carried out at JSC “Ust-Kamenogorsk Poultry Farm” in the village of Kasym-Kasenov, Ulansky District, East Kazakhstan Region. The study of the epizootic situation and diagnostic testing of chick infection with Eimeria under floor-rearing technology were conducted by agreement with the management and together with the veterinary service.

Pathoanatomical examinations were performed on 20 chick carcasses aged 10 and 20 days, obtained at JSC “Ust-Kamenogorsk Poultry Farm.”

Darling’s method – an enrichment technique for preparing fecal samples for helmintho-ovoscopy – is based on sedimentation of Eimeria eggs during centrifugation followed by flotation in a mixture of glycerin and saturated sodium chloride solution. The method is named after American parasitologist S. Darling [7].

After diagnostic studies, the efficacy of 2.5% diclazuril (Diclacox) against Eimeria oocysts under floor rearing of broilers was tested at a dose of 2 ml per 1 L of drinking water continuously for 48 hours.

Two groups of chicks aged 7-8 days, 100 birds each, were selected for the experiment. The first group received diclazuril in drinking water after thorough mixing at the specified dose; the second group received the recommended dose of amprolium in drinking water (baseline drug).

During the trial, the test and control groups were kept under similar conditions and fed the same diet.

From day 5 to day 25 after hatching, the test group received the recommended dose of diclazuril in water daily. The control group received amprolium in water.

Throughout the test period, daily clinical observations were made for general condition, feed and water intake, and visible physiological changes [8,9].

Baseline chick infection with Eimeria oocysts was established one day before drug administration based on coproscopic examination of fecal samples. Subsequently, the therapeutic-preventive efficacy of the recommended diclazuril dose and the rationale for the administration schedule were evaluated by weekly coproscopy of 10 fecal samples and floor scrapings from different sections where each group was kept.

To determine the degree of Eimeria infection in the test and control groups, along with prevalence (extensiveness) of invasion, the intensity of eimeriosis was determined by counting oocysts per microscopic field of view.

Given the lack of clear recommendations for preventive courses of diclazuril via drinking water for chicks, we developed a dosing regimen [10].

Epizootic Situation of the Farm

The selected farm for our research on the stated topic is *JSC “Ust-Kamenogorsk Poultry Farm”*, which raises broiler chickens. This enterprise is located in the East Kazakhstan Region, Ulan District, in the village of Kasym Kasenov.

The company is a vertically integrated broiler enterprise. Such technological complexes combine all stages of poultry production – from the manufacture of highly balanced feeds and the rearing of broilers to slaughtering, processing, and packaging of the finished product. The replacement young stock

is purchased from poultry farms that are free from acute infectious poultry diseases. At the age of 150 days, chicks from the replacement rearing unit are transferred to the parent flock unit, where hens and roosters are kept separately.

After obtaining hatching eggs in the parent flock unit, the eggs are delivered to the hatchery.

The farm is prosperous with respect to acute infectious diseases of chickens but is unfavorable in terms of *Eimeria* invasion.

Table 1– Data on Poultry Mortality Among Young Birds from Infectious, Non-Infectious, and Invasive Diseases for 2023–2024

Indicators	Unit	Years		
		2022	2023	2024
Total number of dead chickens	Head / %	1700	1470	1654
Infectious bronchitis	Head / %	1.62	1.50	1.41
Chicken eimeriosis	Head / %	3.20	2.50	0.20
Infectious laryngotracheitis	Head / %	1.30	1.30	1.30
Alimentary dystrophy	Head / %	1.74	0.60	1.50
Hepatitis	Head / %	2.00	2.40	1.40
Aerosacculitis	Head / %	1.10	2.00	1.60

As seen from the results presented in Table 1, the number of diseased birds is not uniform. It should be noted that the high mortality rate caused by infectious bronchitis and infectious laryngotracheitis in birds aged 1 to 30 days indicates that there are constant disturbances in the balance between microorganisms and the external environment under the current housing conditions. This leads to a weakening of the immune status of the poultry population. The trend of bird mortality from 2022 to 2024 is also uneven: in 2022, 1,700 birds died; in 2023, there was a significant decrease to 1,470 birds; however, in 2024, the mortality rate increased again to 1,654 birds. It should also be noted that the combined mortality from infectious respiratory diseases (infectious bronchitis and infectious laryngotracheitis) amounted to 2.92% in 2023, 2.84% in 2024, and 2.71% in 2025. At the same time, the mortality of chicks aged 0–30 days from *Eimeria* infection (chicken eimeriosis) was 3.2% in 2022, 2.5% in 2023, and decreased sharply to 0.2% in 2024.

The mortality rate of chicks from aerosacculitis during the period from 2022 to 2024 amounted to 4.7%, while hepatitis was recorded in 5.8% of cases. According to veterinary reports, the number of dead chicks diagnosed with alimentary dystrophy reached 3.92%.

At the same time, it should be noted that by 2024, the mortality rate of birds from infectious and invasive diseases had decreased, as the farm had implemented and strengthened a comprehensive system of disease prevention measures.

The veterinary service of the poultry farm implemented emergency measures to prevent the further spread of the invasion. Additional investigations were carried out, followed by a series of sanitary and preventive measures.

According to data from the poultry farm's veterinary service, during 2014–2016, there were repeated outbreaks of chicken eimeriosis in the private sector located near the poultry farm. It was found that about half of the local population were employees of the farm, which led to the introduction of the invasion from the private sector into the production facilities. Subsequently, the infection spread within the poultry farm through the service personnel.

The violation of veterinary and sanitary regulations and procedural guidelines ultimately resulted in an outbreak of chicken eimeriosis at *JSC "Ust-Kamenogorsk Poultry Farm"*.

To determine the presence of chicken eimeriosis at *JSC "Ust-Kamenogorsk Poultry Farm"*, the following aspects were studied:

- The epizootic situation of the poultry farm regarding chicken eimeriosis during the period 2022–2024;
- The diagnostic measures undertaken to establish the diagnosis of chicken eimeriosis;
- The use of a drug as a therapeutic and preventive agent against chicken eimeriosis.

Diclazuril for eimeriosis of floor-reared broiler chickens was administered as a preventive course to the entire test group via drinking water after thorough mixing at 2 ml per 1 L of water for 5 days. In the control group, the entire flock received the recommended dose of amprolium in water.

Each group contained 100 birds. Efficacy was evaluated by weekly selective coproscopy of 10 fecal samples from different floor areas of the involved houses.

We observed the disease in chicks aged 7–20 days. The disease manifested as general depression and thirst. Appetite was initially reduced and then completely lost. Chicks sought warmth, huddled in the corners of the house, and mostly sat ruffled and motionless. Feathers were fluffed, wings drooped. The sick chicks showed general weakness and unsteady gait. Feces were liquid with much mucus and sometimes blood. Diarrhea worsened over time; feathers around the cloaca were soiled with liquid droppings. Death occurred on day 2–3 after onset of clinical signs, characteristic of the acute course.

To establish a diagnosis of chicken eimeriosis, we performed pathological autopsies on 20 dead chicks [11,12].

Most findings involved lesions of the gastrointestinal tract, presenting as catarrhal-hemorrhagic gastroenteritis.

The intestinal wall was thickened; villi of the intestinal epithelium were easily scraped off with a scalpel. Hemorrhagic inflammation and petechiae were noted on the mucosa of the duodenum (Figures 1(a), 1(b)).

Figure 1(a) – Hemorrhages on the intestinal mucosa typical of chicken eimeriosis

Figure 1(b) – Hemorrhagic inflammation of the duodenum in chicken eimeriosis

The presence of these characteristic intestinal lesions indicates chicken eimeriosis. To confirm the diagnosis, we took 10 samples of affected intestine, prepared impression smears, and examined them under a microscope. Eimeria oocysts were found in all 10 samples.

We also examined 10 fecal samples using Darling's method for ante-mortem diagnosis of chicken eimeriosis and isolated Eimeria oocysts [13,14].

Therapeutic and Preventive Measures Against Chicken Eimeriosis.Despite the attention to chicken eimeriosis, this disease continues to trouble poultry farms. This is due to the ability of Eimeria to

“adapt” to the same drug with prolonged use, and also to the fact that in countries with developed industrial poultry production, the development of means and methods to combat the invasion has now been sharply reduced. Only a few new anticoccidial drugs have been synthesized over the past 20 years, among them diclazuril.

Given the wide distribution and pathogenicity of Eimeria, especially for chicks, we aimed to test the efficacy of diclazuril against Eimeria oocysts in broilers under floor housing and to develop a regimen for its use.[14,15]

Two groups of chicks were formed to test diclazuril: test (100 head) and control (100 head).

Before the trial, coprological examinations were performed in both groups.

Table 2 – Results of coprological examinations before the trial

Group	Number of samples	Prevalence (EI), %	Intensity (II), oocysts
Test	10	100	70–150
Control	10	100	100–170

Table 3 – Trial of Diclazuril and Amprolium

Samples	Group	Drug & dose	Regimen	Before: EI, %	Before: II	After: EI, %	After: II	Ext. efficacy (EE), %	Int. efficacy (IE), %
10	Test	Diclazuril, 2 ml per 1 L water	5 days	100	100–150	3	1	93.0	98.7
10	Control	Amprolium, 0.5 g per 1 kg feed	5 days	100	150–170	10	3-7	60.7	75.4

Economic justification of the study Results. We calculated the cost of using anticoccidial drugs, taking into account the drug price per 1 kg, dose, consumption per bird, total treatment cost for 1,000 birds, and the drugs’ extensive and intensive efficacy.

Table 4 – Economic indicators of therapeutic and preventive measures for chicken eimeriosis

No.	Indicator	Diclazuril	Amprolium
1	Drug price per 1 kg, tenge	10,200	9,800
2	Dose g/L	1 g per 2 L water	1 g per 2 kg feed
3	Drug use per bird (water 0.3 L/day; feed 0.2 kg/day)	0.15	0.3
4	Cost of treating 1,000 birds, tenge	1,590	1,800
5	Extensive efficacy	93.0	96
6	Intensive efficacy	98.7	96.7
7	Prevented economic loss	100,000	60,000
8	Economic efficiency of veterinary measures per 1 tenge of costs	7,500	7,500

Discussion. Poultry farming is one of the fastest-growing branches of animal husbandry. The government of the Republic of Kazakhstan pays great attention to the development of existing poultry farms and the construction of new ones, as reflected in various programs supporting domestic poultry farming through financial and material assistance and favorable loans for new facilities.

The rapid growth of Kazakhstan’s poultry sector brings numerous challenges for the veterinary service, primarily ensuring an epizootically favorable status with respect to acute infectious diseases. It should not be forgotten that serious economic damage is caused not only by infectious but also by parasitic (invasive) diseases.

Among the most common invasive diseases, chicken eimeriosis ranks first.

Eimeriosis is a major problem for industrial poultry farms due to its widespread occurrence. Therefore, the development of effective and economically viable therapeutic and preventive measures is a

relevant task today. Eimeriosis occurs in virtually any poultry enterprise practicing floor rearing of chickens.[16]

The main economic damage is determined not only by eimeriosis itself but also by its combination with bacterial or infectious diseases. Therefore, monitoring the epizootic status of poultry enterprises for chicken eimeriosis is of great importance.

At the start of the study, we examined the epizootic status of JSC "Ust-Kamenogorsk Poultry Farm" for infectious, non-infectious, and invasive diseases based on veterinary reports for 2014–2016.

A high mortality from infectious bronchitis and infectious laryngotracheitis in birds aged 1–30 days indicates constant disruptions in environmental microbial balance under the rearing conditions, leading to impaired immune status of the flock. Mortality from chicken eimeriosis was 3.2% in 2014, 2.5% in 2015, and decreased to 0.2% in 2016.

By 2016, mortality from infectious and invasive diseases decreased, as the farm's veterinary service implemented and expanded preventive measures.

Nevertheless, the measures proved insufficient, and recurrent outbreaks of eimeriosis among broilers continued to cause major losses. To prevent this, we decided to conduct a comprehensive diagnostic program to establish an accurate diagnosis[17]

We observed sick chicks: they were inactive, wings drooped, feathers ruffled. Appetite was reduced or absent; thirst increased. Feces were liquid, dark green, with a musty odor uncharacteristic of poultry droppings.

Pathoanatomical examination of 20 dead chicks showed predominantly gastrointestinal lesions presenting as catarrhal-hemorrhagic gastroenteritis. The intestinal wall was thickened; epithelial villi were easily scraped off with a scalpel. Hemorrhagic inflammation and bleeding were noted on the mucosa of the duodenum.

These characteristic lesions indicate chicken eimeriosis. To confirm the diagnosis, 10 samples of affected intestine were taken, impression smears prepared, and examined microscopically; Eimeria oocysts were found in all 10 samples.

We also examined 10 fecal samples using Darling's method for ante-mortem diagnosis and isolated Eimeria oocysts.

With a comprehensive approach to diagnosis, we could confidently make the final diagnosis–avian eimeriosis[18]

To address the situation, we developed a scheme of therapeutic and preventive measures against chicken eimeriosis at JSC "Ust-Kamenogorsk Poultry Farm." To achieve this, we used a new dosage form-diclazuril. Based on our observations and the lack of specific instructions for diclazuril solution, we decided to experimentally study the efficacy of diclazuril at 2 ml per 1 L of drinking water, administered as a therapeutic-preventive course for 5 days.

The experiment involved a 7-day-old chick group of 100 head. A control group of 100 chicks aged 7 days was also formed.

Before the start, fecal coprology was performed to establish baseline prevalence. Results showed 100% prevalence in both groups; intensity ranged 70–150 oocysts per field in the test group and 100–170 in the control group [19,20].

The control group received the baseline anticoccidial drug Amidasol in water. Throughout the experiment, the two groups were kept isolated; diet, feed composition, and housing conditions were identical. Daily observations were made of general condition.

On day 6, repeat coprology was performed. Results showed that with diclazuril at 0.7 g per 1.4 L of water for 5 days at 100% baseline prevalence, EI was 3% with II of 1 oocyst; EE 93.0%, IE 98.7%. In the control group using amprolium, post-trial EI was 10% with II of 3–7 oocysts; EE 60.7%, IE 75.4%.

A substantial reduction in prevalence and intensity of invasion positively influenced survival, weight gain, and feed cost reduction, improving the farm's economic performance.

Conclusion. Under industrial poultry production conditions, with their technological specifics, it is necessary to continuously monitor the epizootic situation regarding Eimeria oocyst occurrence. This provides information on changes in Eimeria invasion and enables control of parasite resistance development to used drugs.

Diagnosis of avian eimeriosis should be comprehensive, accounting for the epizootic situation, clinical signs, pathoanatomical findings, microscopy of intestinal impression smears, and fecal examination by Darling's method to detect Eimeria oocysts.

Under floor rearing of broilers, chemoprophylaxis should be applied using diclazuril at 2 ml per 1 L of drinking water for 5 days.

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ТҮЙІН

Зерттеу нәтижелері бойынша тауықтардың эймериозы – өнеркәсіптік құс шаруашылығында кең таралған, жас құстар арасында жоғары өлім-жітім мен өнімділіктің төмендеуіне алып келетін аса қауіпті паразитарлық ауру екені анықталды. Эймерия қоздырғыштары құс қораларында тез көбейіп, санитарлық-гигиеналық талаптардың бұзылуы жағдайында індеттің өршуіне себеп болады.

Жүргізілген тәжірибелер нәтижесінде антикокцидтік препарат диклазурилдің (2,5%) жоғары тиімділігі дәлелденді. Препаратты 2 мл мөлшерінде 1 литр ауыз суға қосып, 5 күн қатарынан қолдану эймериоз инвазиясының экстенсивті тиімділігін 93,0%, ал интенсивті тиімділігін 98,7% деңгейіне дейін төмендетті. Бұл көрсеткіштер диклазурилдің ампролиумға қарағанда тиімдірек екенін көрсетті.

Диклазурилді қолдану нәтижесінде құстардың жалпы жағдайы жақсарды, өлім-жітім азайды, салмақ қосу қарқыны артты және жемнің пайдалану тиімділігі жоғарылады. Сонымен бірге, препараттың экономикалық тұрғыдан тиімді екені анықталып, шаруашылықтағы жалпы өнім өндіру көрсеткіштеріне оң әсер етті.

Эймериозбен күресте тек дәрілік еммен шектелмей, кешенді шаралар жүргізу қажет: құс қораларын жүйелі түрде дезинфекциялау, төсеніште ауыстыру, су мен жемнің сапасын бақылау, сондай-ақ эпизоотологиялық жағдайды тұрақты мониторингтеу.

Осылайша, жүргізілген зерттеу нәтижелері диклазурил препаратын 2 мл мөлшерінде 1 литр суға қосып, 5 күн бойы профилактикалық курс ретінде қолдану эймериоздың алдын алу мен емдеудің ең тиімді әрі экономикалық тұрғыдан ұтымды тәсілі екенін көрсетті.

РЕЗЮМЕ

Одной из самых скороспелых отраслей животноводства является птицеводство. Это наиболее наукоемкая и динамичная отрасль агропромышленного комплекса. Сельскохозяйственная птица отличается быстрыми темпами воспроизводства, интенсивным ростом, высокой продуктивностью и жизнеспособностью. Выращивание и содержание птицы требует меньших затрат живого труда и материальных средств на единицу продукции, чем в других отраслях животноводства.

Потребность внутреннего рынка в мясе птицы составляет около 450-500 тыс. тонн. Самообеспеченность мясом птицы пока составляет около 50%, хотя производство курятины занимает второе место после производства говядины в стране.

В современном птицеводстве страны наряду с позитивными тенденциями остается немало проблем, требующих комплексного решения. В их число входит и распространение паразитарных болезней кур, встречающихся в птицеводческих хозяйствах разных форм собственности. Исследованиями отечественных и зарубежных ученых доказано, что любое птицеводческое хозяйство, практикующее напольное содержание птицы, неблагополучно по паразитарным болезням, особенно по эймериозу. Практика показывает, что эймериоз является немаловажной проблемой птицеводства. Поскольку нет птицеводческого хозяйства промышленного типа, где бы ни встречалась данная инвазия. Кроме того, при нарушении ветеринарно-санитарных правил в птичниках эймерии могут накапливаться в течение короткого времени в больших количествах

Поэтому на сегодняшнее время основной актуальной проблемой для птицеводства является эймериоз кур. В первую очередь это связано с активным развитием промышленного птицеводства в Республике Казахстан. Эймериоз кур имеет широкое распространение. Из-за большого риска восприимчивости молодого поголовья, эймериоз наносит огромнейший экономический ущерб птицеводству, который складывается не только из потери продуктивности птицы, но и в большом отходе, выбраковке, дополнительной затрате на корма и медикаменты.

В связи с недостаточно организованной работой по лечению и профилактике эймериоза кур в условиях данной птицефабрики, нам представилась возможность изучать эту проблему