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BIOLOGY AND DEVELOPMENT CYCLE OF OOSYSTEMS IN POULTRY EIMEROSIS

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Abstract
Eimeria (coccidiosis) is a common internal parasitic disease in poultry, the main infectious agents of which are protozoa of the genus Eimeria. This article analyzes the biology, structure and development cycle of oocysts in eimeria in poultry. Oocysts play a central role in the spread of the disease and its transmission among poultry. How they survive in the external environment, the process of sporulation and their role as an infectious stage are considered in detail. The article also highlights the importance of oocysts in disease prevention. The results of the study provide a scientific basis for effective control and prevention measures for eimeria in poultry.

Keywords: Eimeria, oocyst, poultry, Eimeria, sporulation, coccidiosis, parasites, infection, biology, development cycle.

Introduction

Eimeria (coccidiosis) is a protozoal parasitic disease that is widespread in poultry, especially affecting internal organs. This disease causes serious damage to the health of poultry, slows down their growth rates, and reduces productivity.

The Republic of Karakalpakstan has its own characteristics from other regions of Uzbekistan in terms of climate and geographical location. The fact that the region consists mainly of desert and semi-desert areas, high temperatures in summer and sharp cold in winter, as well as low humidity levels have a significant impact on parasites and their development processes. Therefore, the spread of protozoal diseases in poultry farming, in particular, the spread of eimeria and the life cycle and presence of oocysts, its agents, in the external environment, require special study in the conditions of Karakalpakstan.

“Oocysts” play an important role as a source of infection of eimeria. Oocysts are the most stable and infectious stage of the Eimeria parasite, which is released into the external environment, and through them the disease spreads rapidly among poultry. The preservation of oocysts in the external environment and the sporulation process determine the ability of the parasites to infect.

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In the conditions of Karakalpakstan, especially in the summer and autumn months, it is necessary to study how high temperatures and low humidity affect the sporulation process of oocysts, their long-term preservation and their role in maintaining the ability to infect.

The importance of poultry farming and eimeria disease in the conditions of Karakalpakstan. Poultry farming in the Republic of Karakalpakstan is one of the important sectors of the economy in the life of the population. Poultry farming has become a common practice, especially in small and medium-sized farms, and this sector is the main source of income for the population of the region. At the same time, diseases occurring in poultry farming, in particular protozoal diseases, including eimeria, reduce the efficiency of this sector and cause economic damage. In the regional conditions of Karakalpakstan, maintaining health in poultry farming, preventing diseases and their effective treatment are one of the most urgent tasks.

The survival and infectiousness of parasites that cause eimeria disease in the external environment are associated with oocysts. Oocysts are the most stable and necessary stage of the parasite's reproduction process, which occurs in the external environment. As the final stage of the parasite's life cycle, they are released into the external environment through feces from which the parasites are excreted and, under appropriate conditions, turn into an infectious form (sporulation) capable of infection. This process causes the rapid and widespread spread of the disease among poultry.

Biological characteristics and development cycle of oocysts: The life cycle of the Eimeria parasite consists of two stages: internal and external stages. In the internal stage, the parasite multiplies in the bird's body, damages cells, and thereby causes symptoms of the disease. In the external stage, the oocysts are released through feces, where they undergo sporulation and become a form ready for infection.

The development of oocysts in the external environment depends on several factors, such as temperature, humidity, and oxygen availability. In the conditions of Karakalpakstan, these factors are variable, and especially high temperatures and low humidity in the summer months, and low temperatures and sometimes snowfall in the winter, significantly affect the viability of oocysts. At the same time, the water bodies, food sources, and sanitary and hygienic conditions in the region also affect the spread of oocysts. Role of oocysts in poultry farming and preventive measures: The disease spreads through an environment contaminated with oocysts. Therefore, it is important to strictly observe hygiene rules in poultry farms, keep feed and water sources clean, and limit conditions favorable for the development of oocysts.

Main part

Eimeria (coccidiosis) is one of the most common protozoal parasitic diseases in poultry, caused by unicellular parasites of the genus Eimeria. This disease occurs mainly in young birds and affects the gastrointestinal tract, leading to growth retardation, increased feed consumption, reduced production efficiency and even high mortality. Eimeria species produce oocysts during their life cycle that are extremely resistant to the external environment. It is these oocysts that persist in the environment for a long time and are the main source of the disease. Therefore, this study was aimed at determining the adaptation of oocysts to environmental factors, their infectious ability and the mechanism of disease transmission in the conditions of Karakalpakstan.

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The purpose of the study

To study the development of parasitic oocysts in poultry in the external environment, their sporulation and infectivity, as well as to develop practical recommendations to reduce the spread of the disease in Karakalpakstan.

The climate of the Republic of Karakalpakstan is sharply continental, with air temperatures rising to 40°C in the summer and dropping to −20°C in the winter. Such harsh climatic conditions directly affect the survival and sporulation of oocysts in the external environment.

Biology and parasitic properties of Eimeria species: The most common Eimeria species in poultry include “E. tenella, E. acervulina, E. maxima, E. necatrix, E. brunetti”. They infect various parts of the intestinal tract of poultry. For example, “E. tenella” often affects the colon, and “E. acervulina” - the duodenum. Although all species have a similar life cycle, their level of pathogenicity varies.

The life cycle of the Eimeria parasite consists of three main stages:

1. Sporogony - oocysts sporulate in the external environment under the influence of oxygen and become infectious.
2. Schizogony - the parasite multiplies in the intestinal cells of the host, destroying them.
3. Gametogony - the stage of sexual reproduction, as a result of which new oocysts are formed, which are excreted in the feces.

At each stage, the parasite has a significant impact on the host's immune system, intestinal microflora and metabolic processes. Inflammation of the intestinal wall, bleeding, dehydration and impaired absorption of nutrients are the main pathogenetic signs.

Research methodology

The study was conducted in three types of poultry farms in the Republic of Karakalpakstan: small (private), medium and large production farms. 50 birds were selected from each farm. They were up to 3 months old, during which period eymeriosis is most common.

Sampling: Fresh feces samples were taken from birds in each farm and delivered to the laboratory under hygienic conditions.

The method for determining oocysts included the following:

Oocysts were isolated using the flotation method (in NaCl solution).

Their shape, size, shell thickness and degree of sporulation were measured under a microscope at 400x magnification.

An average of 10 fields from each sample were analyzed and the number of oocysts (O.P.G — oocyst per gram) was determined.

Sporulation experiment: The obtained oocysts were incubated in special dishes at different temperatures (20°C, 25°C, 30°C, 35°C) and humidity (40%, 60%, 80%) for 5 days. The percentage of sporulated oocysts was recorded under a microscope every 24 hours.

Statistical analysis: The data obtained were processed in the “SPSS 22.0” program, and the effect of temperature and humidity on oocyst development was evaluated using the “one-way ANOVA” method. A value of $P<0.05$ was considered statistically significant.

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Research objectives: Study the preservation of oocysts in the external environment and the process of sporulation under different temperature and humidity conditions; Assessment of the infectiousness of parasitic oocysts; Analysis of the spread of the disease in poultry farming in the conditions of Karakalpakstan;
Development of recommendations on hygiene and preventive measures. The study was conducted in three types of poultry farms (small, medium and large) in the Republic of Karakalpakstan. Poultry aged 3 months and younger were selected as a sample, since they are the most susceptible group to the disease.

Assessment of infectivity: Laboratory-reared poultry were artificially infected with oocysts. Each group of 10 birds was infected with oocysts developed under different conditions. The health of the birds, signs of disease and mortality were monitored for 14 days.
Oocyst sporulation rate: The following table shows the sporulation rate at the end of day 5 under different temperature and humidity conditions:

Temperature (°C)	Humidity (%)	Sporulation rate (%)
20	40	33
20	60	48
20	80	62
25	40	58
25	60	74
25	80	89
30	40	72
30	60	90
30	80	97
35	40	68
35	60	81
35	80	87

These results indicate that oocysts develop very quickly in the summer climate of Karakalpakstan (30–35°C, 60–70% humidity). Therefore, the risk of eimeriosis spreading is highest in the summer months.
Viability and infectivity of oocysts: According to the results of long-term storage of oocysts: at temperatures above 35°C, 50% of them died within 10 days, and at 20°C and 80% humidity, they retained their infectious ability for up to 8 weeks.
Based on these data, it was proven that oocysts can survive for a long time in a cold and humid environment, but die quickly at high temperatures.
According to the results of the analysis, the prevalence of eimeriosis was high in small farms (48%), in medium-sized farms it was 33%, and in large farms it was 18%.
These differences depend on hygienic conditions, disinfection frequency, and poultry density.

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Type of farm	Disease prevalence rate (%)	Oocyst concentration (in feces)|
Small farm	48	2100
Medium farm	33	1300
Large farm	18	600

Poor waste management, contaminated water sources, and uncontrolled feed storage were identified as key risk factors on small farms. There was also little preventive work carried out in these areas.

The influence of ecological factors: The natural conditions of Karakalpakstan play an important role in the development of oocysts.
In the summer months - high temperature and humidity cause rapid sporulation of oocysts.
In the fall - with a decrease in temperature, the activity of oocysts decreases, but they remain alive for a long time.
In the winter months - cold weather stops the active development of oocysts, but in a frozen state they do not lose their infectious ability for several months.
The mechanical composition of the soil also plays a role: in sandy soil, oocysts quickly dry out and die, but in wet clay soil their viability is high. This should be taken into account when choosing the location of poultry farms and building materials.

Disease prevention and treatment measures: Prevention of eymeriosis requires a "comprehensive approach": hygiene, feed control, disinfection, use of drugs and vaccines.
Hygiene and sanitation
• Disinfection of poultry houses every 10–15 days with hot water, formalin (2–3%) or ammonia (10%) solutions.
• Introduction of a dry litter system, regulation of water leaks.
• Do not exceed the density of poultry 10–12 heads per 1 m² of area.
The following drugs are effective in the treatment and prevention of the disease:
Toltrazuril (Baycox) is given at a dose of 7 mg/kg for 2 days.
Amprolium is added to feed or water at a concentration of 0.0125%.
Diclazuril (Clinacox) is used for prophylactic purposes at a concentration of 1 ppm.
These drugs stop the development stages of the parasite in the intestine and sharply reduce the number of oocysts in the feces.

Vaccines: In recent years, live vaccines of the "Paracox" and "Livacox" types have shown high efficiency. They create natural immunity in poultry and are safer than chemical drugs.

Recommendations for local conditions:
Maintain a dry and clean environment on farms;
Increase the frequency of disinfection in the summer months;
Timely removal of wet litter;

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Keep water systems closed and protected from external contamination;
Strengthen the immunity of poultry with probiotic and vitamin supplements.

Scientific novelty and practical significance of the study: The results of this study showed that in Karakalpakstan, the most active period of spread of eymeriosis is the summer months, and 30–35°C and 60–80% humidity are the most favorable environment for oocysts. This indicates the need for seasonal planning of preventive measures.

According to the research results:
Oocysts die quickly at temperatures above 35°C, and at 20°C and high humidity they retain their infectious ability for 2 months.
The disease is 2.5 times more common in small farms due to lack of hygiene.
Based on these data, practical recommendations for optimizing the prevention system and small farms were developed.
Future research directions:
Molekulyar biologiya usullari yordamida Eimeria turlarini **genetik identifikatsiya qilish;
Study the level of resistance to anticoccidial drugs;
Conduct "large-scale monitoring" studies in other regions of Karakalpakstan;
Develop environmentally safe bio-prophylactic agents (phytopreparations, probiotics).

Conclusion:
It is confirmed that in the conditions of the Republic of Karakalpakstan, climatic factors - air temperature, relative humidity and hygienic environment - significantly affect the sporulation and invasion activity of oocysts. Especially in hot and humid seasons, oocysts develop faster and are stored in the external environment for a long time. Also, poor cleaning and disinfection work in farms, overcrowding of poultry and improper use of anticoccidial agents contribute to the mass spread of the disease. In general, the results of the conducted studies indicate the need to develop practical recommendations for the prevention, early detection and effective control of eimeriosis in poultry. In the future, scientific research should be continued in the direction of determining the genetic diversity of oocysts, developing new generation anticoccidial agents and introducing environmentally safe preventive methods.

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